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INDICATIONS FOR PULMONARY RESECTION.

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IN the years that have elapsed since the Royal Australasian College of Surgeons was founded, particularly notable developments have been made in thoracic surgery. The development of techniques that have permitted resection of diseased lungs is especially gratifying. Seldom attempted a generation ago, pulmonary resection to-day is almost common-place. The resultant of recent advances in anaesthesia, in chemotherapy and in surgical technique is such that thoracotomy carries a negligible risk and the mortality of pulmonary resection is no greater than that of a major abdominal operation.

As the feasibility of pulmonary resection has increased, so have the indications for its use. Perhaps never will it be possible to define exactly the indications for resection, because any definition will be subject to frequent revision. At present, if one entire lung is excised, the other one must remain. In lobectomy, the most that can be excised are the right lower and middle lobes and the left lower lobe. It is always necessary, furthermore, to remember that the patient cannot take a leave of absence from life while the operation is being performed; he must continue as a functioning individual throughout. His physical condition, and especially his cardiac and pulmonary reserve, must be carefully estimated from the standpoint of maintenance of life both in the operating room and postoperatively. Development of a more accurate, easily performed test for respiratory reserve than is now available would be a great boon to the thoracic surgeon. However, most patients, even those who are elderly, tolerate resection remarkably well.

Some idea of the indications and of the relative frequency with which they are encountered at present can be gained from study of a sizable group of cases in which pulmonary resection recently was performed. For this purpose, I have selected a group of 200 patients on whom I performed resection at the Mayo Clinic; pneumonectomy was carried out in 100 consecutive cases, lobectomy, in another 100 consecutive cases.

The results of this study are summarized in Table 1, in which the thoracic lesions necessitating resection are listed in order of decreased frequency. In the total series of 200 cases, nineteen different pathological conditions were represented. In 68 cases, or a third of the total number, malignant tumours —including primary carcinomata, metastatic lesions and cylindromata—were the reasons for resection. The next most frequent indication was bronchiectasis, represented by 50 cases, or a fourth of the total number. When all malignant tumours are taken together, as has just been done, tuberculosis ranked third as an indication for resection; pulmonary abscess, fourth and bronchial cyst, fifth. The remaining cases included a variety of other thoracic lesions; all but three of which will be discussed briefly.

Tumours.

It is well known that the first pneumonectomy was performed by Dr. Evarts Graham in 1933 for a lesion reported to be a bronchiogenic carcinoma. According to recent

reports the patient, a physician, is still living. Since this first successful pneumonectomy, neoplasms of the lung have constituted a major proportion of the lesions for which resection has been performed. Primary malignancy of the lung is of common occurrence, altogether too common, and if statistics can be taken at face value, the incidence is increasing. Whereas, in 1900, bronchiogenic carcinoma was listed as the tenth most commonly encountered malignant tumour, to-day it ranks first, accounting for 15 per cent. of all deaths caused by malignant neoplasms.

Whether the increase in frequency of bronchiogenic carcinoma is real or apparent is not important from the standpoint of treatment at present. Since roentgen therapy is of no benefit in treatment of primary malignant tumours of the lung, resection offers the only hope of cure. Therefore, it must not be delayed. The problem of how to make early diagnosis is the most important one that remains in the whole matter of carcinoma of the lung.

considerable time. On the average, six to eight months have elapsed, between onset of symptoms and establishment of the diagnosis of carcinoma of the lung, in my experience. In the great majority of cases, this loss of precious, life-saving time now can be prevented by use of available diagnostic aids.

In 80 per cent. of all cases of bronchiogenic carcinoma, cough is the outstanding, and usually the earliest, symptom. When a patient complains of a new cough or notes change in a pre-existing chronic cough, his physician must consider carcinoma in the differential diagnosis, especially if the patient is of middle age or older. Eighty-eight per cent. of all patients who have bronchiogenic carcinomas are more than 40 years of age; men are affected four to five times as often as women. Other symptoms which immediately should arouse a suspicion of carcinoma include hemoptysis, pain in the thorax, dyspnea and wheezing.

Roentgenography is indispensable in the diagnosis of pulmonary tumours as well as

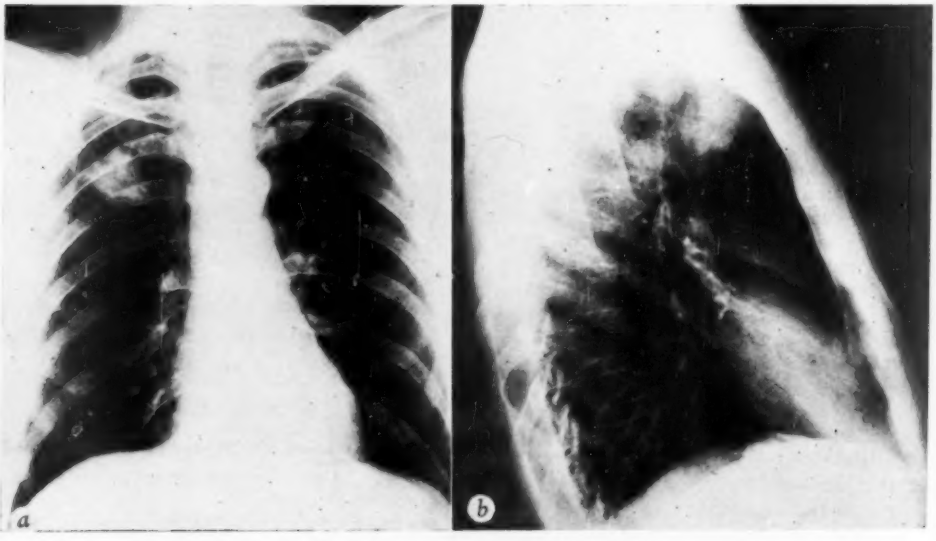


FIG. 1. Peripherally placed primary carcinoma of the lung.

This is true because the asymptomatic period in many cases of malignant tumour probably is much longer than is realized. However, it is equally and deplorably true that symptoms often precede diagnosis by

of all other thoracic abnormalities. A roentgenogram of the thorax should be ordered as a routine on every patient admitted to a hospital or clinic and the procedure should never be omitted from a general physical

examination. In recent years, mass roentgenographic surveys conducted to find undiagnosed tuberculosis have proved the value of routine examinations of apparently well people. In addition to tuberculous lesions, many other abnormalities, including pulmonary tumours, have been discovered, often in an early, asymptomatic stage.

Pre-operative diagnosis of carcinoma of the lung can be made only by means of biopsy or by cytologic study of sputum and bronchial secretions. Approximately 50 per cent. of all pulmonary tumours are accessible to bronchoscopic inspection, and bronchoscopy should be carried out in every case in which surgical treatment is at all

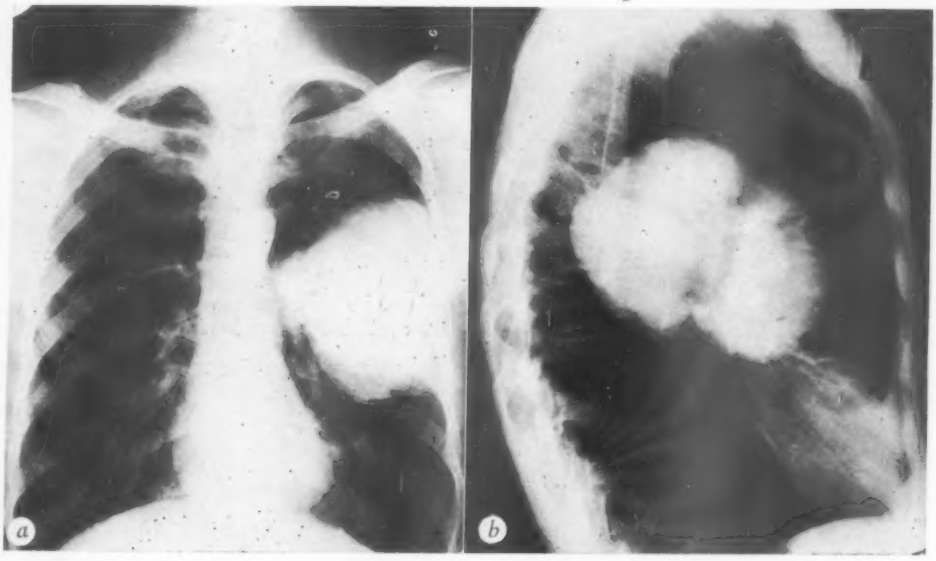


FIG. II. Peripherally placed primary carcinoma of the lung.

Carcinoma of the lung is manifest roentgenographically in three ways: (1) The tumour may cast a distinct shadow. (2) Changes secondary to bronchial obstruction, notably atelectasis or suppurative disease, may be the predominant or only demonstrable feature. (3) The tumour may be atypical, may cast a poorly defined shadow, or may be obscured by a complicating condition, such as pleural effusion.

Neither the clinical nor the roentgenographic picture of carcinoma of the lung is pathognomonic. Even with special techniques, in many instances roentgenography can indicate only the presence of a pulmonary lesion, and an absolute diagnosis of carcinoma never can be made by this means. Roentgenographically, carcinoma may simulate any other pulmonary disease.

feasible. Besides making possible removal of tissue or of other material for microscopic diagnosis, bronchoscopic examination may provide much information as to the situation, extent and operability of a tumour. When a tumour is outside the field of direct inspection, it may still be possible to secure bronchial secretions or bronchial washings for cytological study. Examination of sputum and bronchial secretions for malignant cells is the most recent diagnostic aid and one of those that is most valuable to the thoracic surgeon. In the hands of pathologists skilled in the technique, it is highly accurate, making possible a definite pre-operative diagnosis in about 75 per cent. of all cases of pulmonary tumour. Occasionally, a correct diagnosis of carcinoma has been made by cytological study in the absence of any roentgenographic or bronchoscopic evidence of abnormality.

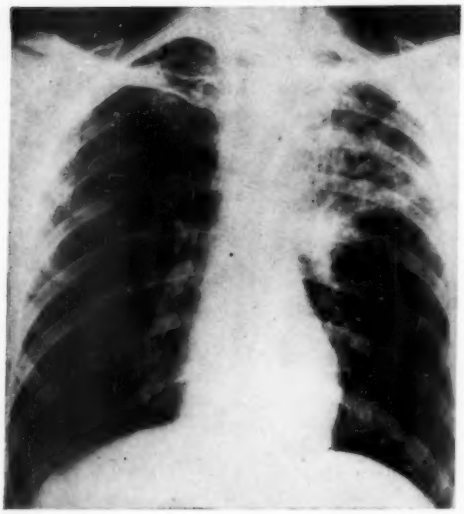


FIG. III. Carcinoma of the left upper lobe of the lung with obstruction of the upper lobe bronchus.

There remains a considerable group of conditions, approximately 25 per cent. of all tumour-like abnormalities demonstrable roentgenographically, in which definite diagnosis cannot be made pre-operatively. These include peripheral lesions inaccessible to bronchoscopic inspection and biopsy, and also lesions which do not communicate with a bronchus, so that material is not available for cytological study. The management of such indeterminate lesions is a problem. Unfortunately, a presumptive diagnosis of unresolved pneumonia, pulmonary abscess or tuberculosis may be made and a policy of "wait and see" often is followed, on the assumption that time will make the diagnosis. Eventually time will, indeed, make the diagnosis but if the patient with carcinoma of the lung is to be cured, the physician and not time must make the diagnosis, even if to make it requires exploratory thoracotomy.

It is my firm conviction that "look and see" is a much better policy than "wait and see." A few years ago, I reviewed a group of 114 cases in which, before thoracotomy, the diagnosis of thoracic lesions was indeterminate. In approximately 60 per cent. of these cases, malignant tumours were found. Resection was indicated, also, for many other conditions in the group, which included examples of bronchial adenoma, pulmonary abscess, lipoid pneumonitis and so forth. When the present negligible mortality of thoracotomy is contrasted with a 60 per cent. probability that any indeterminate thoracic lesion is malignant, the "wait and see" policy cannot be justified. Under antibiotic therapy, a condition attributable to an inflammatory process should show evidence of subsiding within two weeks after the beginning of treatment, and the period of observation never should be longer if there is any reason to suspect malignancy. The physician who procrastinates in such a case is, in my opinion, assuming an unwarranted responsibility. Nobody will misunderstand me I think. I am not so radical as one of my friends unintentionally represented himself to be when hurriedly he said: "The diagnosis was proved pathologically either by excision of the blood vessel or by amputation of the leg." No, every attempt should be made to establish a diagnosis by all available means before thoracotomy.

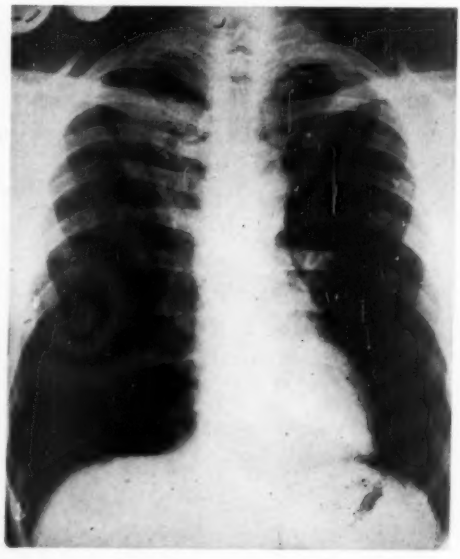


FIG. IV. Carcinoma of the lung simulating tuberculosis.

In considering pneumonectomy versus lobectomy for carcinoma of the lung, it is necessary to weigh the desirability of total pulmonary excision against the immediate risk to, and the probable permanent disability of, the patient. Whenever it can be tolerated, the involved lung and regional

FIG. V. Carcinoma of the lung involving the hilum.

lymph nodes should be excised in accordance with the rule that surgery for cancer should be radical surgery. An occasional exception can be made when the tumour is small, is not in the hilar region, but is centrally or peripherally located in a lobe, and when frozen sections of the regional nodes do not indicate that metastasis has occurred. Of the group of 200 patients to which I refer, 57 had primary carcinoma of the lung; 48 of these were subjected to pneumonectomy and only 9 to lobectomy.

Even with the lung exposed, it is not always possible, by inspection and palpation, for the surgeon to make a diagnosis of an indeterminate lesion and biopsy may be unsafe or impracticable. In such a case, the most conservative resection possible, usually lobectomy, should be performed so that frozen sections of the lesion can be prepared and examined immediately. Whether or not the operation is then completed as a pneumonectomy will depend on the pathologist's report.

Unfortunately, in at least half of all cases of carcinoma of the lung, the tumour is in an advanced, inoperable stage before the patients are seen by a thoracic surgeon. Evidence of inoperability includes fixation of the mediastinum or extension of the growth into, or nearly into, the trachea, as disclosed by bronchoscopic examination; metastasis to the supra-clavicular or axillary lymph nodes, as proved by biopsy; visceral or skeletal metastasis; involvement of the pleura, as indicated by grossly bloody pleural fluid; and the occurrence of Horner's syndrome, of paralysis of the hemidiaphragm, or of fixation of a vocal cord signifying, respectively, unilateral involvement of the cervical sympathetic, phrenic or recurrent laryngeal nerves. When there is no positive evidence of inoperability, thoracotomy should be performed. When cure cannot be expected, but palliative pneumonectomy is technically possible, it is justifiable, since it provides relief of cough, hemoptysis and the suppurative process distal to the tumour.

FIG. VI. Carcinoma of the lung in a congenital bronchial cyst.

In experience at the Mayo Clinic, moreover, results of pulmonary resection for metastatic lesions have been sufficiently encouraging to warrant employment of the procedure in selected cases. One of my patients is apparently well four years after lobectomy for a tumour metastatic from a carcinoma of the ovary; another patient is well three years after lobectomy for a

tumour metastatic from a fibrosarcoma of the leg. A patient of my colleague, Dr. S. W. Harrington, lived for nine years after lobectomy for a lesion metastatic from a carcinoma of the kidney. In the present series, resection was performed in 9 cases for tumours known, or thought, before thoracotomy to be metastatic lesions, pneumonectomy was performed in 6 cases; lobectomy, in 3 cases.

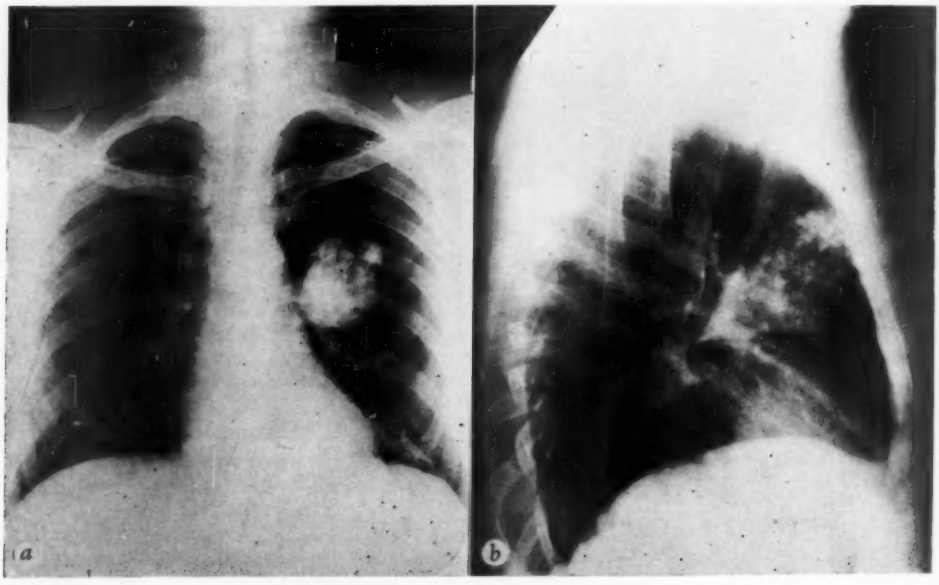


FIG. VII. Metastasis in the lung from a fibrosarcoma of the thigh.

In the entire series of 200 cases were two examples of cylindroma. This is a rare malignant tumour, involving the trachea or major bronchi. In one case the right lung and lower 3 inches (7.6 cm.) of the trachea were resected and anastomosis between the upper portion of the trachea and the left bronchus was effected by means of a polythene tube. The patient in this case died of pneumonia in the post-operative period, but a similar procedure appears to have been successful in treatment of a patient on whom I recently operated.

Although infrequently encountered in comparison with carcinoma of the lung, benign pulmonary tumours, or tumours considered relatively benign, are not of uncommon occurrence. For these, too, pulmonary resection is indicated whenever possible. There is no such thing as an innocuous tumour of the lung. Furthermore, a pulmonary tumour of any size is likely to cause bronchial obstruction. Regardless of the cause, whether it be a tumour, a foreign body, or the products of an inflammatory process, bronchial obstruction creates an intolerable situation. The two factors of infection and impairment of drainage set up a vicious cycle resulting in irreversible changes in the pulmonary tissue peripheral to the site of obstruction. These changes include atelectasis or emphysema, depending on the type and degree of obstruction, suppurative disease and fibrosis. The only reasonable treatment is removal of the cause of obstruction and, when pulmonary damage of any significant degree has occurred, the affected portion of lung had better be removed.

Pulmonary tumours which are considered relatively benign include bronchial adenomata. These tumours grow slowly and, unlike bronchiogenic carcinomata, are of more common occurrence among women than among men. Usually the patients are less than 40 years of age. The symptoms of

adenoma are much the same as those of carcinoma, including cough, hemoptysis and wheezing, but the growths progress slowly. Evidence of the presence of obstructive pneumonitis, or of a mass, are the roentgenographic findings most characteristic of bronchial adenoma.

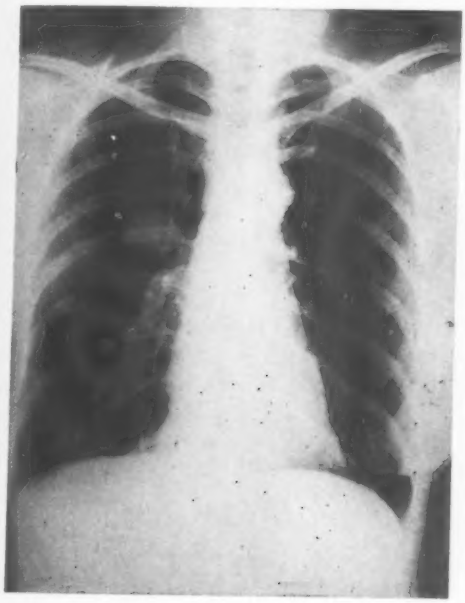


FIG. VIII. Bronchial adenoma.

Adenomata usually arise from the larger bronchi and are therefore accessible to bronchoscopic and biopsy. In the past, the common practice has been to remove these tumours bronchoscopically. However, pulmonary resection is better treatment for a number of reasons. In the first place, the largest part of an adenoma lies outside the lumen of the bronchus, so that its complete removal by bronchoscope is impossible; the procedure may have to be repeated and, in any event, bronchoscopic examination will have to be made periodically for the rest of the patient's life. Although bronchial adenomata have many of the characteristics of benign neoplasms they are potentially malignant; authentic instances of metastasis have been reported. Moreover, since a bronchial adenoma is a highly vascular tumour, its bronchoscopic removal is attended by danger of hemorrhage. And finally, pulmonary resection is desirable because the tissue peripheral to the obstructing bronchial tumour is often irreparably damaged. In this series of cases, bronchial adenoma was the indication for pneumonectomy in 3 cases; for lobectomy, in 1 case.

Hamartoma of the lung was the indication for pulmonary resection in 2 cases in this series. Hamartomata are benign, solid tumours resulting from abnormal development of the bronchial anlage. They may contain all the histological elements of the mature bronchus, with cartilage predominating. They are also called "chondromata" and "bronchiomata." These tumours occur in the parenchyma of the lung and seldom cause symptoms. They are of interest to the thoracic surgeon chiefly because of the difficulty of differentiating them roentgenographically from other, more serious pulmonary lesions. Since hamartomata are not accessible to bronchoscopic inspection and biopsy, certain diagnosis can be made only by thoracotomy and microscopic examination of frozen sections. The extent of pulmonary resection is determined by the location and size of the hamartoma. Often local excision is possible, but in one case in this series pneumonectomy was necessary for a tumour 9 cm. in diameter located near the hilus; lobectomy was necessary in the other case.

In one case, pneumonectomy was necessary because of the presence of tumour-forming amyloid. This condition is probably a form of primary or atypical amyloidosis which differs from the more commonly occurring secondary amyloidosis in that there is no history or evidence of preceding suppurative disease. Although its occurrence in the lower part of the respiratory tract is rare, tumour-forming amyloid must be included in the indications for pulmonary resection. In the case represented in this series, the tumour formed a stony-hard mass in the middle lobe of the right lung, completely occluding the bronchus and causing atelectasis with concomitant symptoms.

CHRONIC SUPPURATIVE DISEASE.

Pulmonary resection for chronic suppurative disease of the lung has proved to be one of the most rewarding applications of modern thoracic surgery. Persons who otherwise would have been relegated to a life of

semi-invalidism, social ostracism and economic dependency have been restored to happiness and normal living. This category of pulmonary diseases includes bronchiectasis, chronic pulmonary abscess and infected pulmonary cyst. Infection coupled with inadequate drainage is common to all these conditions, and their symptoms, complications and prognosis are similar.

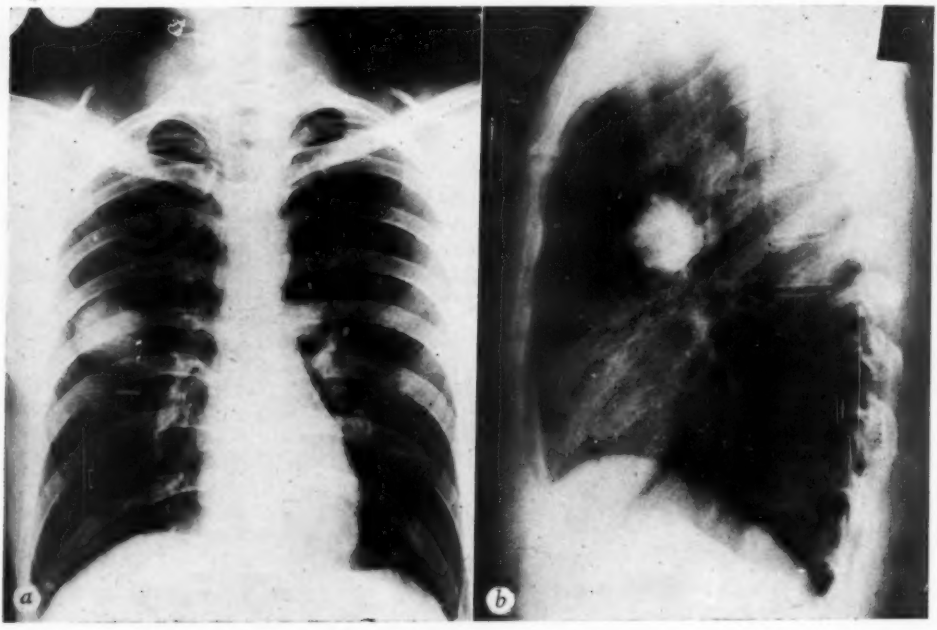


FIG. IX. Hamartoma of the lung.

It is not necessary to relate the symptoms of bronchiectasis. They are sufficiently well known to all. It should be mentioned that in recent years a gratifying decrease in the incidence of bronchiectasis has become apparent. This may be owing to the use of vaccines for prevention of whooping cough and to effective use of chemotherapeutic agents and antibiotics in treatment of bronchopneumonia of childhood. Both of these diseases can be attended by serious bronchial damage, leading to the development of bronchiectasis.

Bronchography, in which lipiodol is used to delineate the bronchial tree, is indispensable in establishing the diagnosis of bronchiectasis and in defining the situation and extent of the process. The lower lobes are involved several times as often as the upper lobes, and the left lung is affected more often than the right. Often more than one lobe is involved.

Chemotherapy is of the greatest prophylactic value in pulmonary resection for any cause and, in bronchiectasis, treatment with penicillin has been particularly helpful. In this condition it is customary to administer the antibiotic for several days preceding surgical operation. Especially when penicillin is administered by nebulization, the antibacterial effect causes marked reduction in volume of sputum, so that resection can be carried out with greatly reduced risk and difficulty.

Depending on the site and extent of involvement, resection for bronchiectasis may consist of pneumonectomy, lobectomy, lingulectomy or, rarely, segmental resection. Multiple resection often is feasible, especially among children and young adults, who tolerate the procedure very well. In this series, 16 patients underwent pneumonectomy

and 34 patients, lobectomy for bronchiectasis. Among patients who were subjected to lobectomy, more than one lobe was resected in 21 cases.

FIG. X. Primary amyloid tumour of the right hilum simulating carcinoma of the lung.

Chronic abscess of the lung is another debilitating condition for which pulmonary resection is indicated. An abscess may be considered chronic if it has been present for more than twelve weeks. Many acute abscesses will respond to chemotherapy, especially if this treatment is combined with bronchoscopic aspiration of secretions. But by the time an abscess has become chronic there are generally irreversible pathological changes, such as bronchiectasis, bronchostenosis, fibrosis and atelectasis. The abscess may have no communication with a bronchus, or its outlet may be inadequate for the drainage and ventilation necessary for healing of a lesion in which anaerobic organisms frequently are secondary invaders.

In my opinion, external drainage of a pulmonary abscess is rarely indicated. Even if the procedure brings about healing of the abscess there is almost sure to be residual infection and some degree of disability. In short, abscess of the lung is one of the numerous pulmonary conditions in which the seemingly radical procedure of resection is, in the long run, the most conservative treatment available.

Abscesses occur in the right lung more often than in the left lung, presumably because the more nearly vertical course of the right bronchus is conducive to aspiration of foreign material. Not infrequently, pulmonary abscesses are multiple, especially if they are of long standing. In this series of cases, pneumonectomy was carried out in 5 cases of multiple pulmonary abscess, lobectomy in an additional 9 cases.

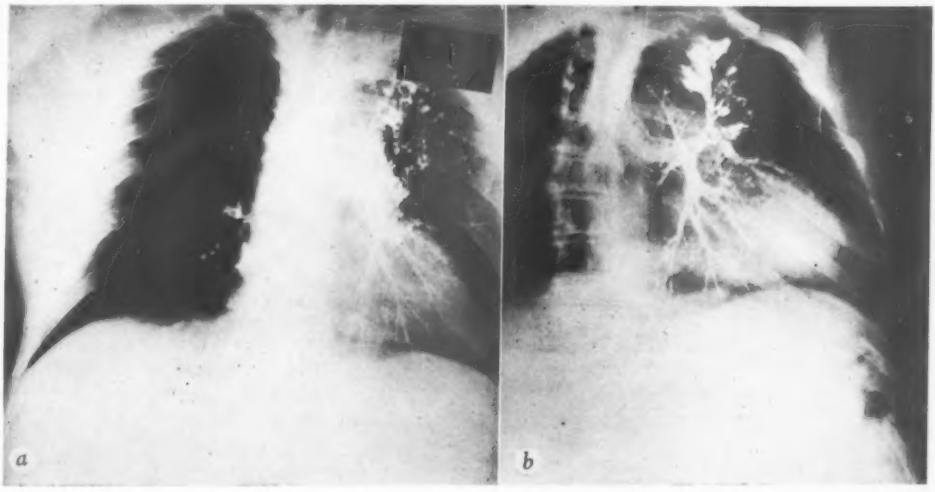


FIG. XI. Bronchogram showing bronchiectasis of the left upper lobe.

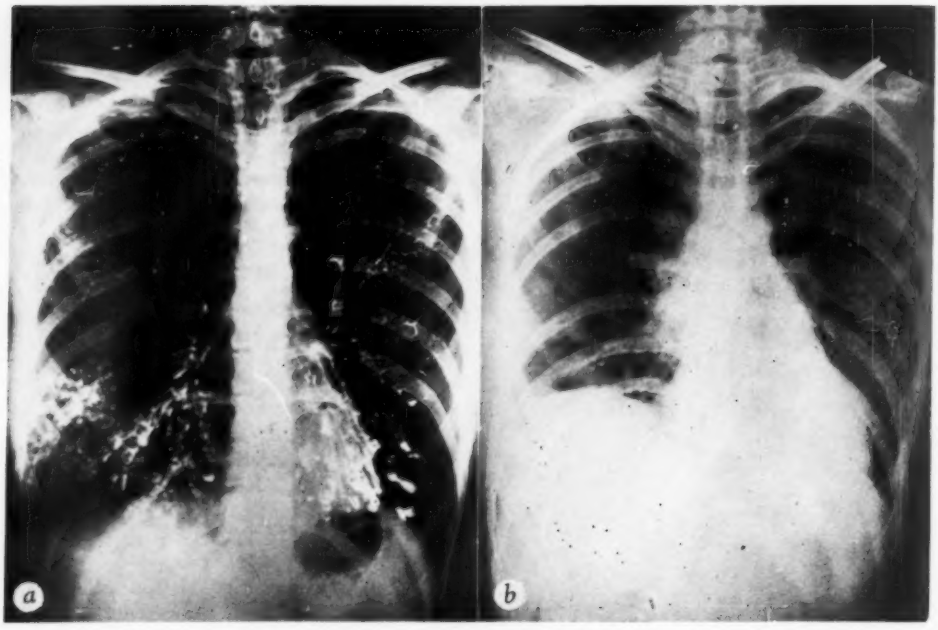


FIG. XII. (a) Bronchiectasis of both lower lobes.
(b) After bilateral lower lobectomy.

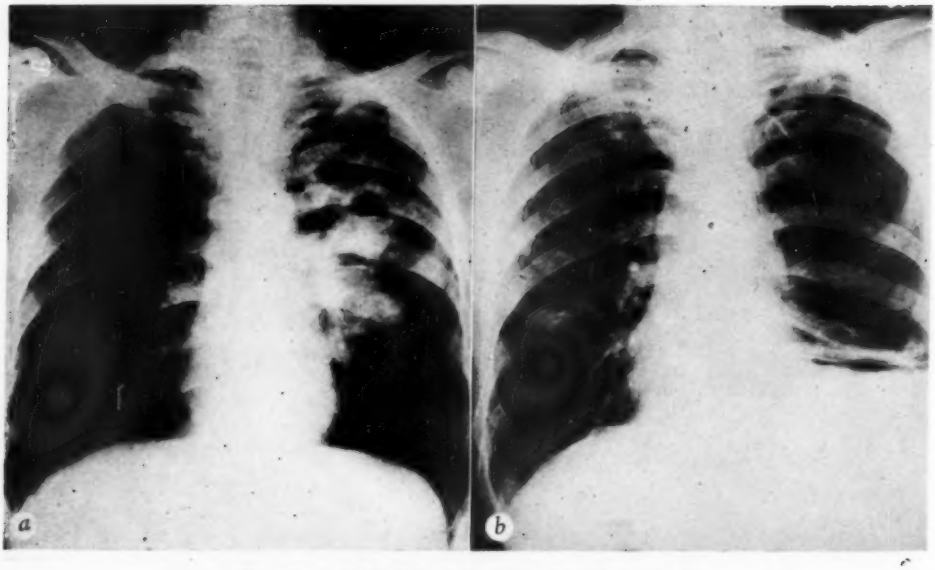


FIG. XIII. (a) Multiple abscesses of the left upper lobe.
(b) After left upper lobectomy.

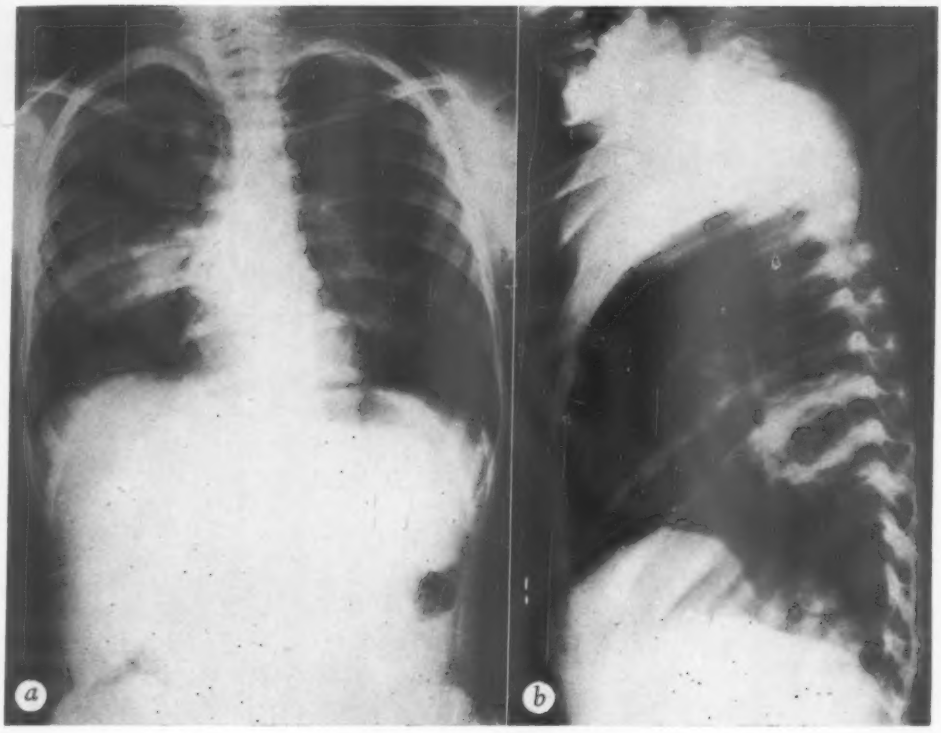


FIG. XIV. Abscess of right lower lobe.

Pulmonary cyst constitutes another indication for resection. Cysts of the lung may be bronchial or alveolar in origin. Bronchiogenic cysts tend to become infected and often cause irreversible pulmonary damage. Malignant changes occasionally may develop in the wall of a bronchiogenic cyst. Differential diagnosis often is difficult, since a cyst of this type may be roentgenographically indistinguishable from a tuberculous cavity, a pulmonary abscess or empyema. There is danger of mistaking a carcinoma that is undergoing cavitation for a bronchial cyst. In view of these facts, thoracotomy and pulmonary resection are indicated whenever possible.

Pulmonary cysts of alveolar origin generally are referred to as emphysematous blebs and bullae. They consist of hyperventilated sacs caused by rupture and coalescence of dilated alveoli. Blebs are located immediately beneath the visceral pleura. Bullae may occur in any part of the lung. Blebs and bullae may be very small or they may be huge, completely collapsing the remaining lung. When symptoms are produced, dyspnoea usually is the chief complaint. Not infrequently, the thin wall of a bleb ruptures, producing pneumothorax. This probably is the mechanism in nearly all cases of spontaneous pneumothorax.

Surgical intervention should be considered when a bleb or bulla progressively increases in size, when secondary infection occurs, or when recurrent spontaneous pneumothorax supervenes. Since cysts of this type may occur in association with generalized emphysema, it is advisable to select a surgical procedure which will conserve as much pulmonary tissue as possible. Sometimes a surface defect can be repaired but more often it is necessary to resect a lobe, a segment of a lobe, or, occasionally, a whole lung.

In this series of 200 resections, bronchial cysts were the indication for lobectomy in

9 cases, for pneumonectomy in one case. The presence of emphysematous blebs made lobectomy necessary in 2 cases, pneumonectomy, in one case.

Provided the disease is reasonably well confined to one lobe or one lung, resection is the treatment of choice; the same is true when cavitation is very extensive or when

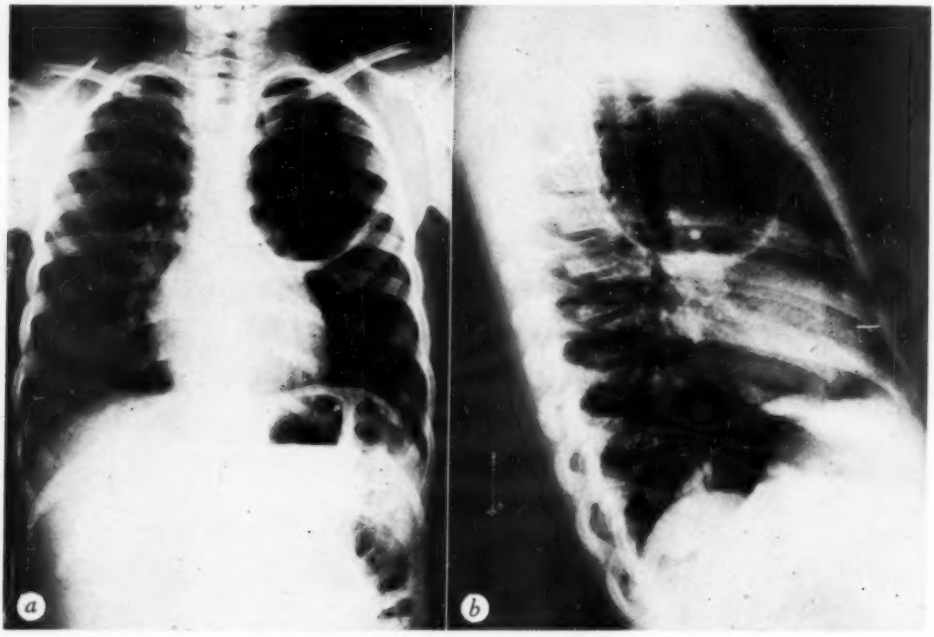


FIG. XV. Congenital bronchial cyst.

TUBERCULOSIS.

In cases of pulmonary tuberculosis, resection has proved to be a very valuable, often a life-saving measure. Excision is by no means a substitute for other, more conservative methods of treatment in tuberculosis. Rather, it is a valuable addition to treatment of this diseaase.

Already the indications for resection in pulmonary tuberculosis are fairly well defined. The procedure is indicated in many cases of parenchymal infection complicated by bronchial disease. A severe bronchial stricture, irreversible atelectasis, cavities of the tension type and tuberculous bronchiectasis are all conditions in which collapse therapy is either useless or contraindicated; resection is the best, and usually only, effective treatment.

cavities are near the hilus. Under these conditions it is probably best to proceed with resection as soon as possible, without first subjecting the patient to pneumothorax or thoracoplasty. These more conservative procedures should, of course, be given a trial whenever there is a fair possibility that they may bring about control of the disease. Cases in which thoracoplasty has failed, however, constitute another category of pulmonary tuberculosis in which resection may be indicated.

Resection sometimes is necessary for tuberculous basal lesions, although such lesions, if not complicated by bronchiectasis, often can be controlled by pneumoperitoneum combined with temporary interruption of the phrenic nerve. Finally, excision is the only treatment for tuberculoma, a comparatively rare lesion.

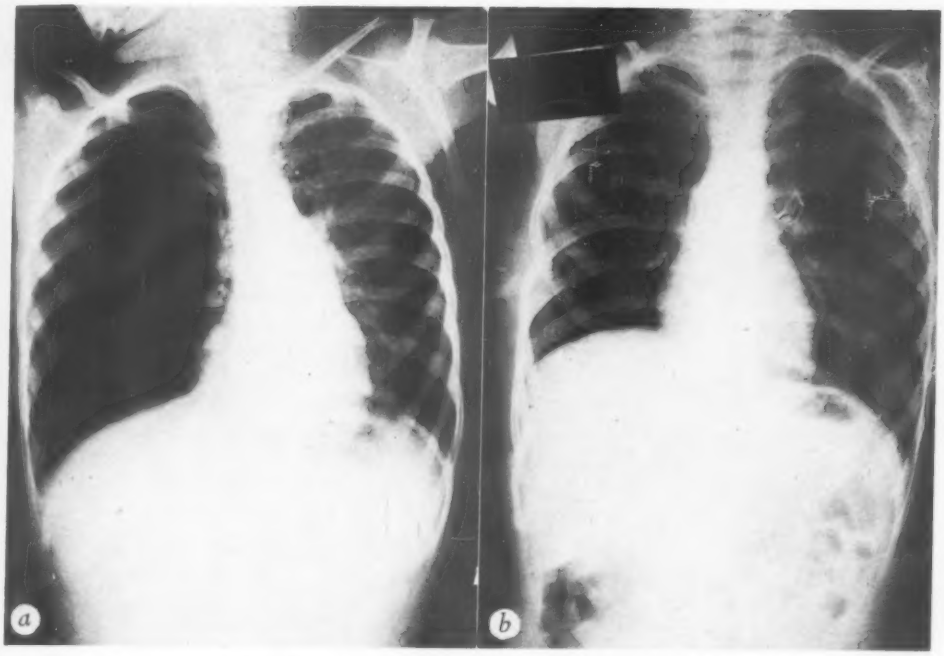


FIG. XVI. (a) Huge emphysematous bleb of the right lung.
(b) Expansion of the lung after removal of the bleb.

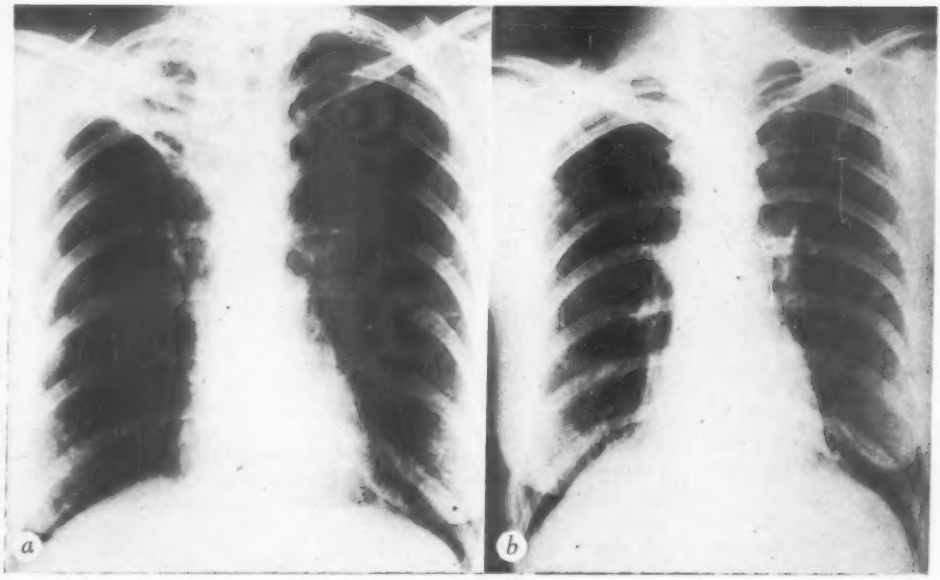


FIG. XVII. (a) Tuberculous stricture of the right upper lobe bronchus with complete collapse of the right upper lobe.
(b) After right upper lobectomy.

Successful use of resection in pulmonary tuberculosis is dependent on careful selection of cases which, in turn, must be based on thorough knowledge of the pathology and clinical course of the disease. Resection has special hazards for tuberculous persons. There is danger of reactivation of old foci and of bronchial dissemination of infection. Tuberculous broncho-pleural fistula and empyema may be distressing sequelae. Excessive distention of remaining pulmonary tissue is particularly hazardous for tuberculous persons—first, because such stretching may precipitate breakdown of imperfectly healed lesions and, second, because the respiratory reserve of these patients often is already lowered as a result of proliferative and degenerative changes in pulmonary tissue. It is hoped that some of the prosthetic devices which we and other investigators are using experimentally will prove to be practicable for filling the space left when a lobe or lung is resected, thus preventing mediastinal shifting and overexpansion of remaining pulmonary tissue.

Improvements in surgical technique and the use of chemotherapy have reduced or eliminated many of the hazards of resection in pulmonary tuberculosis and, for the most part, patients tolerate the procedure surprisingly well. Prophylactic treatment with streptomycin undoubtedly is of great value. It should be remembered, however, that because of the rapidity with which bacterial resistance may occur, the preoperative period of treatment should be brief, probably not longer than a week, to insure persistence of the suppressive effect of the antibiotic throughout the postoperative period.

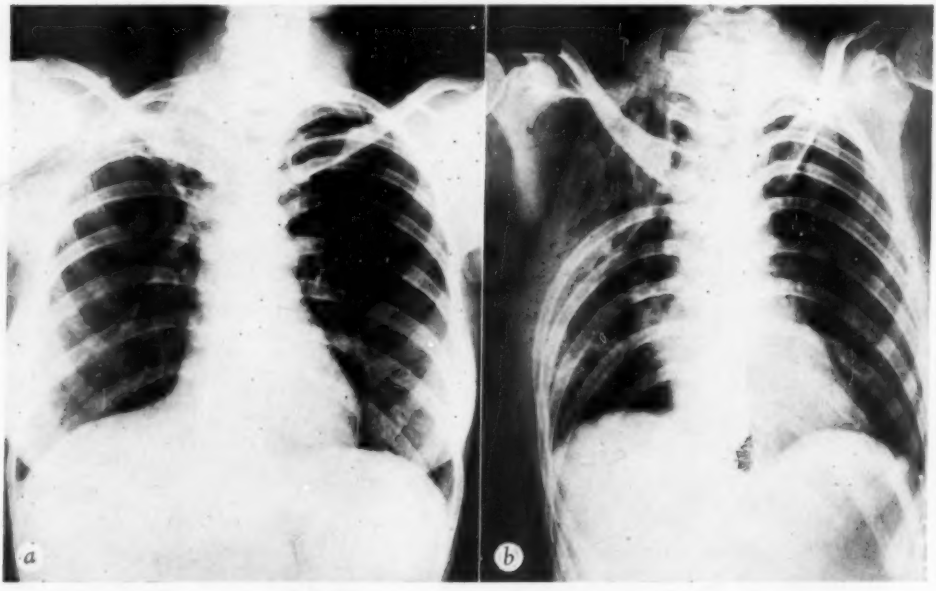


FIG. XVIII. (a) Tuberculous stricture of right upper lobe.
(b) After one-stage right upper lobectomy and a five rib thoracoplasty.

It must be remembered, also, that excision cannot be depended on as definitive treatment in tuberculosis, which really is a systemic disease. Pulmonary resection should be combined with other indicated treatment and particularly with rest, which continues to be fundamental in the treatment of tuberculosis. The months following surgical intervention are very important. Whenever possible, the patient should receive sanatorium care during his convalescence.

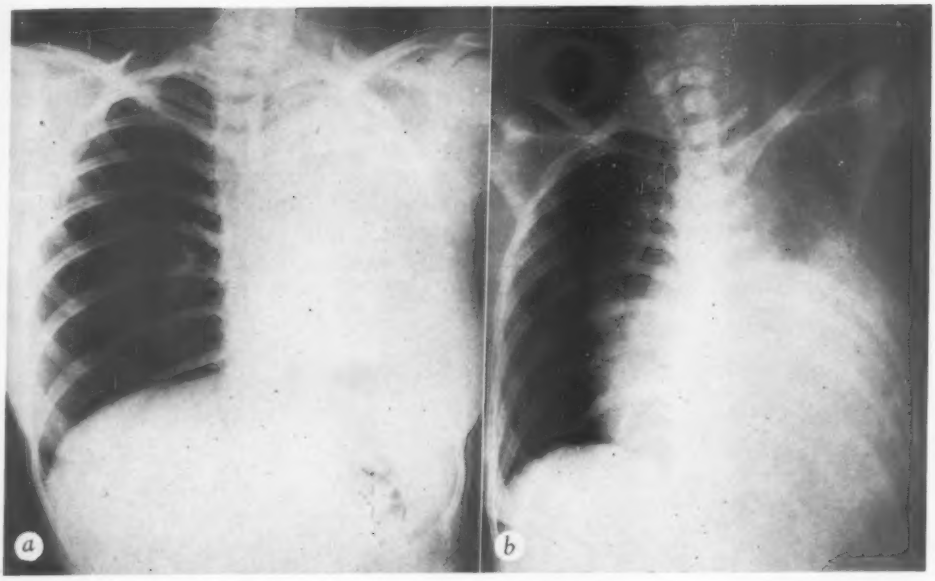


FIG. XIX. (a) Tuberculous stricture of the left main bronchus with complete consolidation of the left lung.

(b) After one-stage pneumonectomy and thoracoplasty.

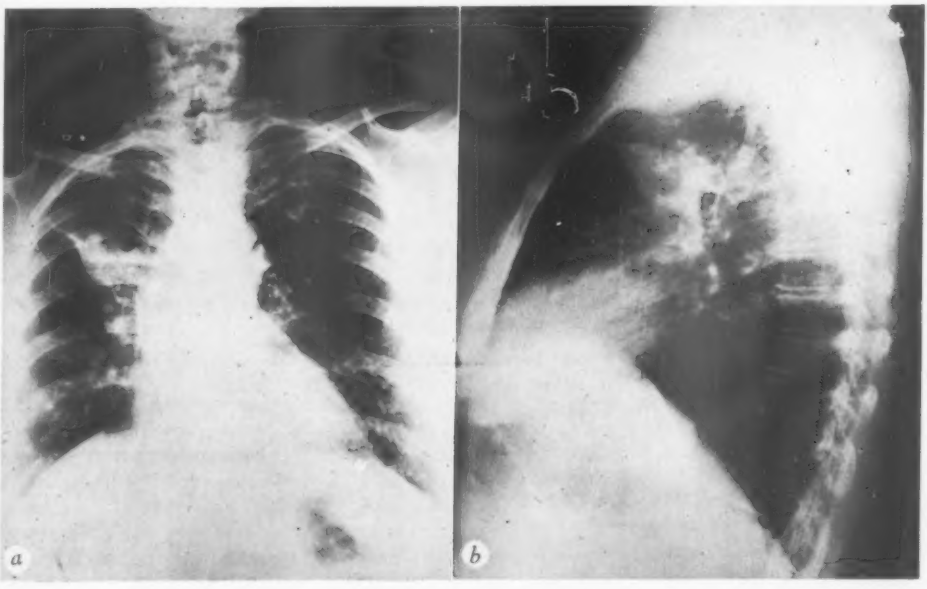


FIG. XX. Broncholithiasis.

In this series of 200 cases, tuberculosis was the indication for resection in 29 cases; in 11 cases for pneumonectomy, and in 18 cases for lobectomy.

BRONCHOLITHIASIS.

Bronchol ithiasis is a not uncommon indication for pulmonary resection. The condition probably results from erosion of calcified lymph nodes into the bronchial tree.

MYCOTIC AND PARASITIC DISEASES.

Mycotic and parasitic diseases occasionally constitute indications for pulmonary resection. Sometimes the indication is therapeutic. More often, however, resection is performed because it is impossible to make a positive diagnosis without excising the lesion for histopathologic and bacteriologic study.

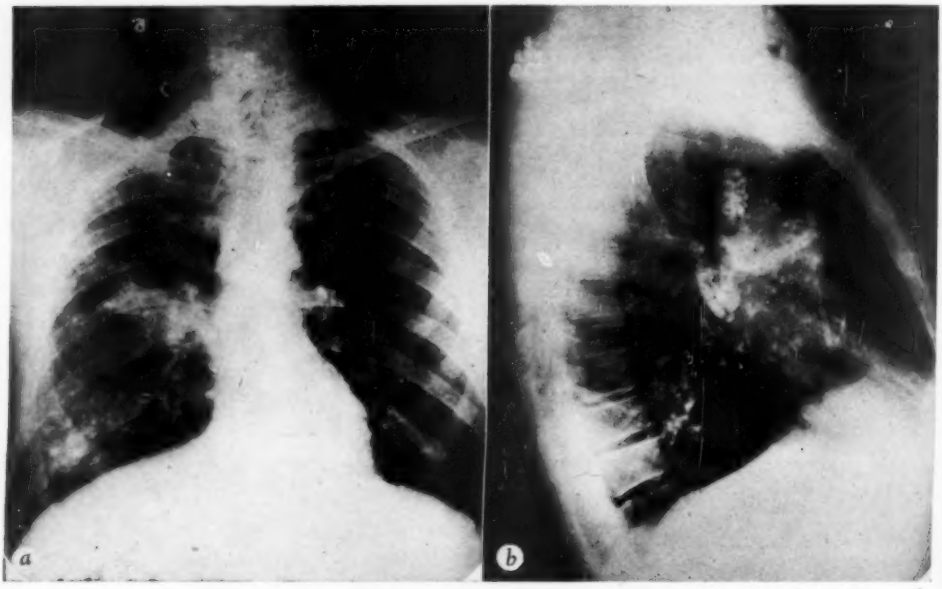


FIG. XXI. Actinomycosis of the right upper lobe.

The concretions, often called "lung stones," are generally considered to be residua of old tuberculous infections. They may be coughed up, whole or in fragments, and cause no further trouble. In some instances calculi can be removed bronchoscopically. Resection is indicated when the stones cannot be seen with the aid of the bronchoscope, and when they have produced bronchial obstruction, with the usual undesirable secondary effects, including chronic suppurative disease. In the group of 200 patients here under consideration, broncholithiasis was the reason for lobectomy in 5 cases and for pneumonectomy in one case.

Actinomycosis is often unilateral and usually begins in a lower lobe. Resection may be indicated if the process is not too extensive. Lobectomy, combined with treatment with penicillin, was curative in the one case in this series.

Coccidioidomycosis is endemic in some areas and also may occur as apparently isolated cases. The roentgenographic appearance of the lesions is variable and often is indistinguishable from that of carcinoma. Resection may be indicated for this reason or because of severe pulmonary haemorrhage. Pneumonectomy was required in the one case of the series here reported.

Histoplasmosis is a mycotic infection in which the lungs are the organ most frequently involved. There may be a mild, asymptomatic form of the disease, in which healing takes place and the only residual evidence is calcification of the hilar lymph nodes and sensitivity to the specific antigen. When the disease is severe enough to be recognized clinically, prognosis is usually very poor. In the one case in this series, a large cavity in the right lower lobe caused a severe cough and resection seemed advisable. The result was excellent.

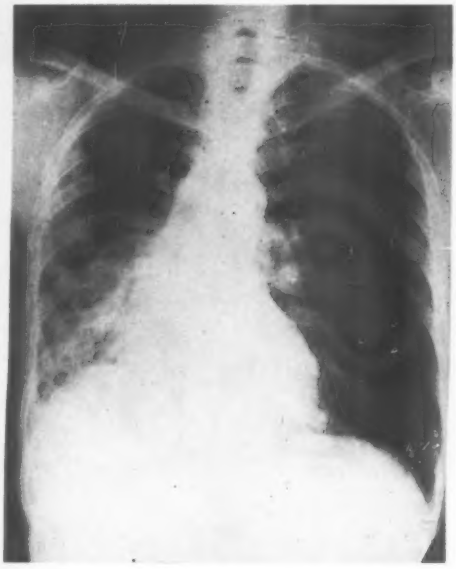


FIG. XXII. Coccidioidomycosis of right lung.

Echinococcus or hydatid disease of the lung is rare in my experience although common in some parts of the world. In the one case in this series, the right middle lobe contained an echinococcus cyst and was resected.

MORTALITY.

In the last few years the operative mortality of pulmonary resection has reached what is probably close to an irreducible minimum. In this group of 200 patients, 5 deaths were attributable to the surgical procedure. All but one death occurred among patients operated on for malignant tumour, who ranged in age from 37 to 60 years. In the series of 100 consecutive cases in which lobectomy was performed, there was only one death; the patient was 67 years old. In the series of 100 consecutive cases in which the operation was pneumonectomy, the other 4 deaths occurred. As already has been said, the patient whose trachea was resected died a few days after operation. Death came to one patient whose lung was resected for carcinoma and who presented, also, contra-lateral eventration of the diaphragm. Another patient who had cancer of the lung died following an operation which included extensive resection of the thoracic wall into which the malignant growth had penetrated. One patient succumbed following pneumonectomy for extensive tuberculosis complicated by the development of empyema and the emergence of a streptomycin-resistant strain of tubercle bacilli.

The mortality of thoracotomy alone is, of course, lower than that of thoracotomy and resection. In fact, I cannot recall a single death in recent years among my patients who underwent thoracotomy without resection. The minimal risk of the procedure very seldom needs to be considered a deterrent to its use. Again I wish to emphasize the urgency of early diagnosis of carcinoma of the lung and the necessity for thoracotomy in every case in which the lesion is indeterminate and in which operation is at all feasible. Despite the best cooperative efforts of clinician, roentgenologist, bronchoscopist, pathologist and bacteriologist, diagnosis of many pulmonary lesions cannot be made pre-operatively. In these cases there should be no disposition to evade exploratory thoracotomy. More than half of all indeterminate lesions will prove to be carcinomata and another large fraction is likely to consist of other conditions for which resection is the best or only effective treatment.

THE FUTURE.

As a new half century begins, it is interesting to speculate on the future of

thoracic surgery. So far as pulmonary resection is concerned, there seems reason to doubt that the technique will undergo drastic change and since the mortality already is so low, obviously it cannot be reduced much further. I suspect that the greatest change will concern the very subject of this discussion — the indications for pulmonary resection. Given freedom from those forces and control, tuberculosis is being discovered in early stages, so that the more radical methods of treatment seldom are necessary. Eventually, if progress is allowed to continue, the disease should be nearly eradicated. It is entirely possible that most, if not all, of the mycotic diseases which may involve the lungs will be susceptible to the increasing arsenal of antibiotics.

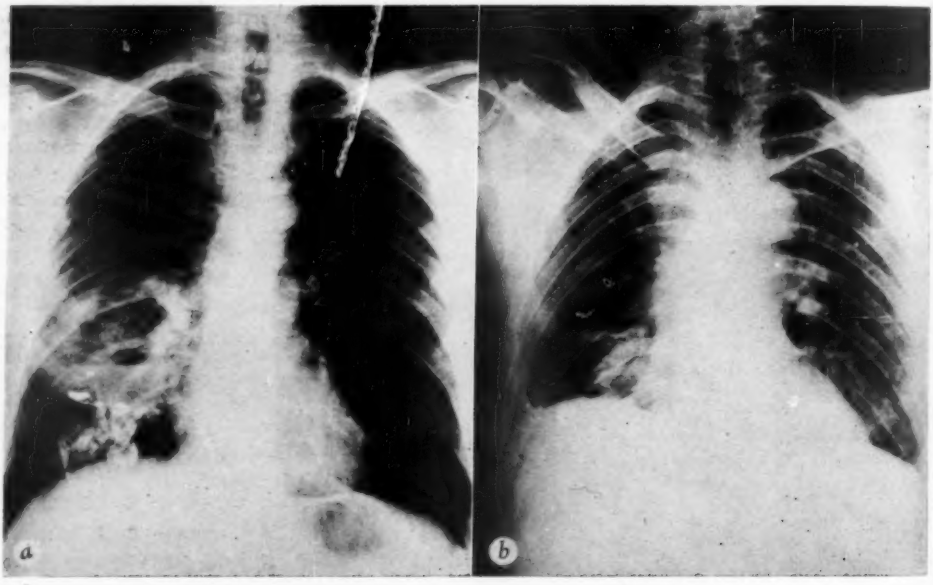


FIG. XXIII. (a) Cavitating lesion of the right lower lobe due to histoplasmosis.
(b) After right lower lobectomy.

which disrupt and destroy the work of man, it seems very likely that chronic suppurative disease soon will become a relatively rare indication. The excellence of modern anaesthesia, the perfection and increasing application of bronchoscopy, and the universal use of chemotherapy have almost eliminated the factors responsible for bronchiectasis, lung abscess and other chronic suppurative disease as it has been known.

In the years ahead, there should be another sharp reduction in the number of cases of tuberculosis suitable for resection. With the present programs of case finding

There probably will remain the congenital or developmental lesions of the lung and the neoplasms. This last-named class of diseases shows no sign of abatement. Carcinoma and other tumours of the lung probably will continue to increase in frequency, at least in proportion to the increasing longevity of the human race. Until the riddle of the cause of neoplasms is solved, or until better treatment is found, pulmonary resection will continue to be a surgical procedure of the greatest importance and increased effectiveness of pulmonary resection requires increased effort toward earlier diagnosis.

TABLE 1.

PNEUMONECTOMY AND LOBECTOMY, CONSECUTIVE CASES OF EACH.

	Pneumon-ectomy	Lobec-tomy	Total	Hospital deaths
Bronchiogenic carcinoma	48	9	57	1
Metastatic carcinoma	6	3	9	
Bronchiectasis	16	34	50	
Tuberculosis	11	18	29	1
Pulmonary abscess	5	9	14	
Bronchial cyst	1	9	10	
Broncholithiasis	1	5	6	
Indeterminate granuloma	0	4	4	
Bronchial adenoma	3	1	4	1
Bronchial stricture	3	1	4	
Emphysematous blebs	1	2	3	
Cylindroma of bronchus	2	0	2	1
Hamartoma	1	1	2	
Amyloid tumour of bronchus	1	0	1	
Coccidioidomycosis	1	0	1	
Echinococcus cyst	0	1	1	
Histoplasmosis	0	1	1	
Actinomycosis	0	1	1	
Hemangio-endothelioma	0	1	1	1
Total	100	100	200	5

MEGALOCORNEA AND ITS SURGICAL COMPLICATIONS.

By J. Bruce Hamilton.
Hobart.

TWO years ago, Black (1948) described a unique series of cases of congenital glaucoma seen in Adelaide; in a personal communication he has informed me that since then he has seen two more.

In this paper it is my intention to describe the opposite number, namely megalocornea for at the beginning of this century the disease had not been recognized clinically.

Historical.

In the first decade of this century, Parsons (1905) stated: "Megalocornea or keratoglobus is found in buphthalmos, (hydrophthalmia, megalophthalmos). This is a condition of congenital glaucoma, and will best be discussed in connection with that subject." That was the orthodox and accepted definition of megalocornea fifty years ago.

The story of megalocornea as a separate entity seems to unfold from 1913 onwards when Treacher Collins (1913) reported a case of buphthalmos in a male aged 17, who had been observed since 1910. In three years there had been no change in the patient's eyes, the optic discs were not cupped and the field of vision was not contracted.

Treacher Collins (1920) again reported this case, but this time he called it a case of megalocornea. His report on this case and his reasons for his change in nomenclature constitute an important chapter in this subject because it was apparently the first time that megalocornea had been dissociated from buphthalmos. In his report he quoted Kayser (1914) as recording the particulars of a family in which 17 individuals belonging to four generations were found to have enlargement of the cornea, up to 14.15 mm., with perfect transparency, increased depth of the anterior chamber, enlargement of the iris, good vision, no cupping, and normal tension. The condition showed no tendency to progress, it occurred in strong healthy persons who carried on various occupations without the least hindrance. In only one case, glaucoma followed in later life. The male sex only was affected, but transmission was through the female line and in no case was any other congenital abnormality present.

Kayser, therefore, concluded that the prenatal origin of these cases seemed certain and that the condition was simply a gross enlargement of the cornea, i.e., a true megalocornea.

Two years later Elliott (1922) summed up the position regarding megalocornea. He stated: "The view would appear to be gaining ground, that a condition exists which is often confused with buphthalmos, but which differs from it essentially in as much as it is a product of overgrowth and not of overstretching. If that view is established the name 'megalocornea,' or some substitute for it, will be justified. But there is still a good deal of spade work to be done before we can rest from our labours with the confidence that all the difficulties have been cleared up."

Tradition dies very hard, and in 1930 Doggart reported a case of buphthalmos with normal vision. In summing up he stated: "Whether the case I have recorded should be designated buphthalmos or megalocornea is of no great importance, but I have preferred to use the term bupthalmos because I think it improbable that there is any sharp line of division between the two conditions."

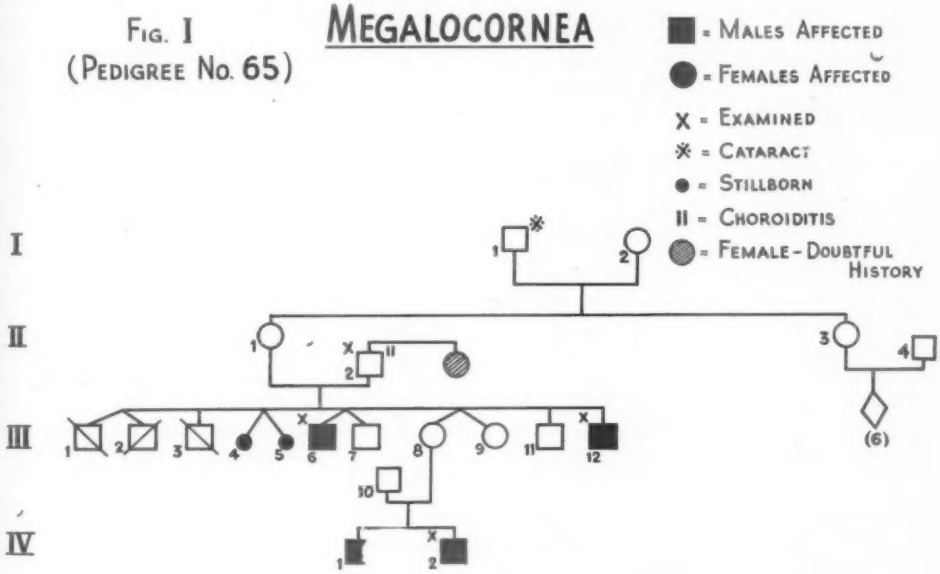
Vail (1931) changed the name to "adult hereditary anterior megalophthalmos sine glaucoma." He reviewed 73 cases, 67 of which were males, and in 39 of whom there was a family history of the condition. The youngest was 3, and the oldest 85 years. It should be noted that 43 of the 73 cases were over 20 years of age. He thus proved beyond a doubt that buphthalmos and megalocornea were distinct diseases. He then went on to report 18 of these cases which had had a cataract extracted and although he described megalophthalmos sine glaucoma no less than 3 of the 18 cases had glaucoma. On this point he wrote: "There is no evidence of

glaucoma except as possibly developing later in life, or as a result of complete dislocation of the lens." This is a very important remark, and will be referred to later.

COMPLICATIONS.

Barkan and Borley (1936) reported a mother and 3 sisters with cornea plana and chronic glaucoma, but no remarks were made contrasting this condition with megalocornea.

FIG. I
(PEDIGREE No. 65)



Rosen (1945) wrote on megalocornea but made no mention of chronic senile glaucoma complicating this condition. He enumerated the complications of megalocornea as follows:—

1. Embryotoxin.
2. Krukenberg's spindle.
3. Night blindness.
4. Iridodonesis and dislocated lens.
5. Hypotension—which indicates that low tension is the order of the day.

As regards complications the following considerations are relevant:

1. The incidence of megalocornea in any community.

An approximate answer to this question has now been supplied in Tasmania because an analysis of blindness required an analysis of eye diseases, and in 1947, it was found that out of 11,000 eye cases 10 had megalocornea. This is a disease of 1 in 1,100, that is, 0.09 per cent., a very low figure.

2. The binocular blindness rate in megalocornea.

There was no case of binocular blindness from megalocornea in an analysis of 104 blind in Tasmania made in 1948, nor was there a child, either at the Blind School or at the Sight Saving School with this disease. This is because megalocornea in itself is a symptomless abnormality in childhood at least. But megalocornea may not be without dangers in adolescence or old age.

3. The monocular blindness rate in megalocornea.

This stands at 3 in 11,000 cases in Tasmania. In 2 cases the blindness was due to the same cause, namely, the disease being mistaken for buphthalmos during the first two decades of this century with consequent operation. In the third case the patient had amblyopia ex anopsia following a convergent concomitant strabismus.

4. The nature of megalorcornea.

Anderson (1939) covered a wide ophthalmic field in proving beyond doubt that megalocornea was not a congenital glaucoma, but he added that it was frequently related to arachnodactyly (Marfan's syndrome), and that the only late complications were lens opacities. This is not true for Tasmania. Further, he pointed out that megalocornea was predominately a disease of the male and that only 8 per cent. were females. The Tasmanian incidence in females is 44 per cent. which gives this condition quite a new complexion.

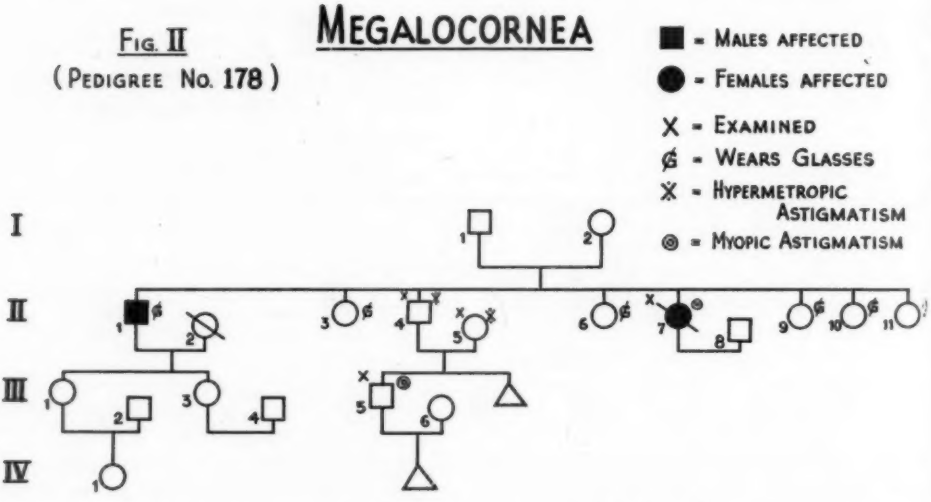
6. Other complications not enumerated by Rosen (1945).

Of the 15 Tasmanian cases 4 developed chronic glaucoma, i.e., 27 per cent. and no less than 3 of these were females. Two of these 3 females with chronic glaucoma in their early adolescence had had their other eye trephined for apparent buphthalmos, but I feel in both instances that it was a faulty diagnosis which initiated this treatment.

I wish to point out, therefore, that megalocornea is not a safe disease at any time after the thirtieth year especially in

FIG. II

(PEDIGREE NO. 178)



5. The question of inheritance of megalocornea.

In 1947 I was unable to find any pedigrees of megalocornea which were sufficiently convincing to warrant inclusion in the survey made in Tasmania (Hamilton, 1947) but now 2 very incomplete pedigrees are available (Figs. 1 and 2). By 1950 the number of Tasmanian cases of megalocornea has risen to 15, but the percentage of absolutely inherited ones is 4, i.e., 27 per cent. and these are all in Fig 1 which is a sex-linked transmission. Of the 15 cases, 7, i.e., 44 per cent., were females, but 2 of these had only unilateral megalocornea.

the sporadic female cases, because chronic glaucoma may supervene. In one instance this happened while the patient was under observation. It seemed clear that this was not an incidence of a smouldering buphthalmos because two other patients were well over 50 before they developed glaucoma and one can hardly expect congenital glaucoma to take 50 years to manifest itself.

I feel that the glaucoma of megalocornea belongs to the anatomical group of glaucoma.

Another common complication and one also not mentioned by Rosen is senile cataract. This is important because Vail (1931) reported 7 cases of his own with

cataract in megalocornea all of which had their cataract extracted. But still more important is the fact that spontaneous retinal detachments occurred in 3 of these 7 cases after cataract extraction.

TREATMENT OF COMPLICATIONS.

For senile chronic glaucoma in megalocornea, miotics can be tried, but failing these a 1½ mm. trephine seems to suffice. There do not seem to be any very special features about the operative or post-operative treatment.

To the cataract extraction results, which seem less happy, I can add one case of spontaneous detached retina after cataract extraction to Vail's 3 cases. I know of no special methods to avoid spontaneous retinal detachment following cataract extraction in cases of megalocornea, but it needs consideration. My case occurred ten days after operation and was undoubtedly produced by spontaneous haemorrhage. I have found no other mention in the literature about this occurrence, but Vail (1931) recommended a small Graefe section with enlargement by scissors in an attempt to circumvent this complication. This type of cataract section seems now to have found great favour in America in all types of cataract surgery.

SUMMARY.

1. Megalocornea is undoubtedly a definite clinical entity, but like buphthalmos is subject to raised intra-ocular tension.

2. Only 25 per cent. of cases of megalocornea are so involved, whereas in 100 per cent. of buphthalmos the intra-ocular tension is raised.

3. This increase in intra-ocular tension is a very important complication and must be watched for in megalocornea in adult life.

4. In one case it occurred at the age of 30 years, but in the oldest case it did not appear until about 60 years of age.

5. This complication appears 3 times as commonly in females as in males.

6. Senile cataract is a further complication and the extraction of this type of cataract appears to be followed frequently by spontaneous retinal detachment.

ACKNOWLEDGEMENTS.

I have to thank Dr. D. H. Waterworth for allowing me to report one case, Miss Oldham of the Gordon Craig Library of the Royal Australasian College of Surgeons, for many references, and the National Health and Medical Research Council for their continuous assistance in the form of a secretarial grant.

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THE MANAGEMENT OF CARCINOMA OF THE PROSTATE.

By KEITH KIRKLAND.
Sydney.

IN the light of present knowledge, management of carcinoma of the prostate is undertaken either with a view to cure or with a view to palliation. Cure is only to be contemplated in the small proportion of cases in which total removal of the neoplasm by surgery can be anticipated but in a high percentage of inoperable cases, death may be postponed and symptoms relieved by hormonal therapy. In the remainder nothing can be done to influence the progress of the disease and treatment is limited to sypmtomatic relief.

FREQUENCY.

Hinman (1948) stated "Of all malignances in men of all ages, cancer of the prostate is seventh in frequency, cancer of the stomach being first. But in men over fifty it is first, and with the rising expectance of life span, it presents a problem of increasing magnitude." This condition occurs in about 15 per cent. of cases presenting with complaint of bladder neck obstruction but all observers are agreed that the incidence when asymptomatic cases are included, is considerably greater in the later years of life. Rich (1935) found the condition apparently as occult pathology in 28 per cent. of males between the ages of seventy one and seventy five years in consecutive autopsy studies. Young (1945) reported cancer in 21 per cent. of his cases with bladder neck obstruction.

Before considering the management of prostatic carcinoma I would like to discuss briefly symptomatology and diagnosis of early cases. The growth can exist for a considerable time without causing any symptoms. A slow and general invasion of the gland by the adeno-carcinoma may occur without any pain and when symptoms do appear they are not distinctive of cancer but masquerade under the unimpressive subjective observation of a minor disturbance of micturition. Complaint is often deferred until appreciable obstruction has occurred and by then invasion of the capsule, with fixity of the gland, has resulted. Slight variations in bladder physiology are accepted as being quite consistent with late middle age but in at least one patient in six, these variations are caused by cancer. A nocturia of one, slight hesitancy and a smaller stream, rarely result in a patient seeking a surgical opinion. Obviously as the first symptoms, which may be caused by a well established growth are productive of no serious upset and are generally regarded as of no great moment, surgery can only be applicable and cure possible to a greater percentage of patients, when in the cancer age, even minimal variations in urination are fully investigated.

Coupled with the late onset of symptoms, often of a trivial nature, is a marked inadequacy in the diagnostic methods available. A high degree of accuracy in recognising early cancer of the prostate does not follow even an intensive study of every patient suffering from a minor degree of bladder neck obstruction. These unsatisfactory features of the disease, objective as well as subjective, result in 5 per cent. or less of cases being operable when detected.

Decision is generally accurate in the well established case, but surgery is not feasible when one encounters a large, fixed and stony hard gland. Occasionally, even in advanced growths, difficulties occur in that rectal examination which is often the only diagnostic measure, is not exact enough to distinguish the highly cellular neoplasm from hyperplasia or the small carcinoma from the fibrous gland. Endoscopy is of no assistance in early diagnosis. Microscopic

examination is of great value, but none of the methods of obtaining tissue, transurethral resection, perineal excision of the doubtful area, aspiration biopsy or punch biopsy can be regarded as infallible in obtaining neoplastic tissue when the growth is small.

Biochemistry has been invoked as a diagnostic aid but the early promise has not been realised. In 1935-36 Kutscher and his coworkers showed that prostatic extracts and secretions contain an acid phosphatase which although occurring elsewhere, is formed in large quantities exclusively in the prostate of adult males. Carcinoma arising from adult epithelium often retains this property as also do distant metastases. Various observers, notably, Huggins (1941) reported that the serum acid phosphatase becomes increased in patients with prostatic cancer with a greater increase on the formation of secondary growths. Unfortunately this raised serum content does not always result, even in the presence of an advanced growth, the so called false negative finding. Woodard and Dean (1947) discussed the value of acid phosphatase content as a diagnostic measure and in the cases observed with bone metastases only 72 per cent. showed an increase and in the absence of metastases only 34 per cent. They stated "as far as is known at present prostatic phosphatase is the only one which will cause elevation in serum acid phosphatase readings when sodium-beta-glycero-phosphate is used as substrate." Despite this much needed standardisation of reagent, false negatives occurred in too high a proportion of cases for negative figures to be of any great value. On the other hand a positive finding or abnormally high serum figure is of definite diagnostic importance.

As an indication of clinical progress, serum acid phosphatase figures are of doubtful value in that after the alteration of endocrine balance by treatment anomalies occur as the figure often remains low despite progress of the growth, which would appear to have changed its chemical behaviour. Until an accurate biochemical test is introduced diagnosis at the stage when cure by surgery is possible, would appear to be largely a matter of chance.

TREATMENT.

1. *Surgical.*

Radical perineal prostatectomy was first performed by Hugh Young in 1904. The operation was planned with a full appreciation of the pathways of growth spread and Young carried out a block removal of the prostate and vesicles including all the anterior and posterior covering fascia. Very little has been added to this surgical conception in the intervening years.

In 1948 Jewett reviewing the John Hopkins cases reported a 39 per cent. survival with no sign of cancer in 132 patients operated upon five years before. Of 63 cases operated upon at least ten years before, 19 per cent. had survived without evidence of recurrence. The operability of the condition is always difficult of assessment and this was demonstrated in the figures quoted by Jewett as in 78 cases in which the growth was thought to be confined to the capsule, at operation it was found to be extra-prostatic in 32. Radical surgery was accepted as indicated in 11.2 per cent. of cases but the majority of surgeons practising the operation accept 5 per cent. as being about the figure. By the use of hormones the percentage may be raised. Colston and Brendler (1946) observed in growths which were invading the bases of the vesicles and extending towards the apex of the gland that initial regression occurred at the periphery on administering stilboestrol. They concluded that the actively growing marginal cells react to androgen deprivation before those which are older and more centrally placed. They advised oestrogen medication both in cases deemed suitable for surgery and in those about the border line of operability. Jewett concluded by saying: "until it can be demonstrated that the conservative management of a comparable group of microscopically proved cases will yield as high a percentage of ten years cures, radical perineal prostatectomy remains the

procedure of choice for early cancer." In contrast to this opinion the operation is rarely performed in Australasia. Recently I sent a questionaire to the 54 members of the Urological Society of Australasia and received answers from 47. Of these 3 only ever perform a radical operation, 2 quite incidentally and 1 in approximately 5 per cent. of cases. Justification of this conservatism is in the fact that the use of oestrogen therapy with or without castration generally confers such benefit as to warrant avoidance of a mutilating surgical procedure in the aged. A further reason is the fact that the perineal operation for benign hyperplasia has never been commonly practised in this country, while at the present time a nation-wide shortage of hospital beds makes ambulatory treatment preferable when any choice is possible.

The retro-pubic approach has been used for radical prostatectomy but evidence of its value is inconclusive and the method is of such recent application as to make assessment impossible.

2. *Hormonal.*

An appreciation of the physiological principles involved is necessary before discussing management on hormonal lines.

The prostate gland and female breast each require a hormone for their development and physiological existence. The former fails to develop in males castrated before puberty and in such eunuchs to whom testicular androgen has never been available there has been no reported case of carcinoma of the prostate. Beatson (1896) pointed out that mammary cancer, metastatic in menstruating women would regress partially or completely in some patients when the ovaries were removed and he reported 3 cases. This dependence of breast pathology on ovarian secretion later found a parallel in the behaviour of prostatic cancer following castration. It is impossible to review in detail all the investigations on the etiology and development of cancer of the prostate but much of the evidence suggested a biochemical background and that chemistry, if not offering a complete solution might at least provide further understanding.

The discovery and subsequent synthesis of the molecules of male and female sex hormones not only made available an important therapeutic weapon but also afforded a standard for chemical evaluation of similar but possibly carcinogenic substances. In 1933 a carcinogen from coal-tar was isolated by Cook and others called 1:2 benz-pyrine, which, in its molecular structure, resembles the sex hormones and is weakly oestrogenic in action. This relationship suggested the important concept that cancer may be due to an alteration in normal metabolism in which there is formed a carcinogen, instead of a normal hormone. The slight difference between pathological and physiological may explain the benefit that results from oestrogen therapy and also why oestrogens never cure cancer of the prostate. If androgens and oestrogens are true physiological antagonists and the cancer is due to a chemical substance slightly different to normal androgen, oestrogen dosage however accurate cannot quite balance the chemical equation.

In 1941 the practical implications of the biochemical pattern were demonstrated in several series of patients by a number of observers. Huggins stressed the significance of serum acid phosphatase and reported its increase in a high proportion of patients with cancerous prostates, but subsequent findings, as I have mentioned, have not confirmed the value of this observation. He also reported marked improvement, both in general health and cancer pathology following castration and the administration of oestrogens with an appreciable drop in the serum content of the enzyme. Munger recorded improvement following castration by radiation with survivals up to seven years. Herbst, by using oestrogens alone, achieved similar success by what was virtually hormonal castration. A relationship between androgens, oestrogens and growth pathology was thus demonstrated, and further the results not only inferred the potential control of malignant disease but suggested that

many cases of carcinoma of the prostate could no longer be regarded as autonomous but dependent on general systemic influences. Cancer of the prostate and female breast have this unique feature in common, as both respond for varying periods and in varying degree to an artificially created hormonal imbalance.

Despite this progress, we are basically little better off in that, the causal factors in cancer of the prostate are completely unknown, no cures have been effected except by radical surgery and the rationale of hormonal treatment remains obscure. Nevertheless this new chapter in our knowledge, although still punctuated by gaps and marred by lack of continuity and logic, records one of the most hopeful efforts in solving the cancer problem. In actual practice, rather more than 80 per cent. of patients can be rendered comfortable and fit and the empiricism may be ignored. In a responsive case the clinical changes are little short of miraculous. An emaciated, anaemic patient, short of breath, incapable of physical and mental effort, passing urine with the greatest difficulty and discomfort and wracked by the pain of metastatic growths can, within a few weeks, be improved in every respect and apparently cured. This benefit in varying degrees may persist for eight or nine years. In contrast, Bumpus (1926) in reviewing 1,000 cases of prostatic cancer reported that two-thirds of those with metastases at the time of the first examination, died from the disease within nine months.

The object in treatment is to create an alteration of endocrine balance at the expense of the androgenic influence and this may be achieved by surgical or X-ray castration when the patient is deprived of the testicular supply, or indirectly by giving oestrogens which appear to neutralise male hormones. About one case in seven does not respond to any treatment and as yet there is no scientific basis in the selection of cases for castration or hormone treatment. Further, in the latter, dosage is largely by trial and error and one cannot forecast either the medication required to modify the androgenic status or the period of time for which benefit will result. One school performs castration as soon as possible after diagnosis and continues oestrogen dosage of or equal to 5-10 mg. of diethyl-stilboestrol per day indefinitely. This would appear to be the more generally accepted practice in America. It is the method advised by Deming and an analysis of the results of treatment in eighteen hundred pooled cases reported to the Uro-surgical Society in America shows that the best results have followed orchiectomy plus the administration of hormone. (Dean 1949.)

Of the 47 Australasian surgeons who replied to the questionaire, 8 only perform immediate castration following diagnosis, some of the remainder never performing the operation and others reserving it until the growth becomes oestrogen resistant. In the case, when oestrogen administration is the primary therapeutic approach 15-30 mg. of diethyl-stilboestrol or the equivalent are given daily for two or three weeks, in which time, in the responsive case a marked improvement will have occurred. Herbert (1946) found the earliest objective sign indicating response to be a sharp fall in the initial high serum acid phosphatase. If no improvement results within the space of a few weeks it may be generally assumed that castration will rarely confer any benefit, the exception being that the operation may diminish dramatically pain caused by metastases. After relief has been effected the daily medication may be reduced, a maintenance dose of 5-10 mg. or even less being sufficient to sustain the improvement.

Management on endocrine lines has not been employed yet for ten years and no authoratative conclusions are available as to which method of treatment is productive of the best results or ensures the longest survival. Certainly no marked differences have been demonstrated and whereas the results in treatment of the pooled cases of the Uro-surgical Society suggest immediate castration, Nesbit in 1944, after a careful analysis concluded the end result was very much the same.

Obviously, the rationale is very different but before making any distinctions it must be stressed that in this empirical treatment

little consistency in results has occurred. Castration removes all gonadal supplies of androgenic substances but does not deprive the growth of androgenic influences presumed to come from the adrenal cortex. Despite initial improvement the cancer continues its activity and appears to recover from the alteration of background probably, by an increase of supra-renal action. This is believed to be brought about by greater activity of the anterior lobe of the pituitary after removal of the inhibitory functions ascribed to the testes. The administration of oestrogens in theory neutralises but probably more accurately modifies androgenic influence from all sources. The clinical improvement following castration is generally more rapid than by giving oestrogens, particularly for the relief of pain from metastases, yet the latter form of treatment appears to cause more marked regression in the primary growth than does castration. One can only speak in general terms and the irregularity in response to any type of therapy is reflected in the case reports since 1941. For example Nesbit (1944) has found that when the castrated patient developed pain due to metastases relief was most often obtained by giving oestrogens whilst in a recent patient of my own regression of the primary growth occurred after the administration of stilboestrol but dosage up to 150 mg. per day did not diminish pain from secondary growths. Castration resulted in complete relief in a few hours. Some biochemical observations further confirm the different modes of action of castration and oestrogen administration. Castration diminishes the oestrogenic urinary excretion and increases the elimination of androgens and pituitary gonadotropic hormones, whereas the giving of stilboestrol results in the opposite happening in the urinary content of these substances (Dean and others, 1944).

One argument in favour of early castration is concerned with the human factor. Patients forget to take pills regularly, use up the supply and because they are feeling well do nothing about it and often, when subjectively improved, decide no further treatment is necessary. When castrated they remain castrated and are more inclined to accept the seriousness of their position and follow instructions because they have had an operation.

Even in the cases which respond satisfactorily to treatment the cancer is still present and although its progress may be checked for a period of years, death will inevitably result from its activity if the patient survives the other risks of the later decades of life. At any stage the cancer may acquire an autonomy and become quite independent of endocrine influences and frequently a return of obstructive symptoms occurs. Treatment then is the same as for the cases which do not respond to hormonal therapy and is purely symptomatic. Trans-urethral resection or cystostomy will have to be performed and X-ray therapy used in an attempt to alleviate the pain caused by metastases. In the patients unresponsive to treatment from the beginning, progress is generally rapidly downhill. As yet there is no explanation for this lack of response in about one patient in seven to castration and or oestrogen administration but it is of interest that in the last two cases I have seen of this type the growth consisted of completely undifferentiated anaplastic cells.

The microscopic picture of the cancer varies. At one end of the scale the neoplasm consists of immature and unspecialised cells and there are all degrees of differentiation to the type of growth at the other end of the scale which consists of adult epithelial cells with a modified reproduction of the acinar structure of the normal gland. As this variation creates difficulties in diagnosis both by physical and microscopic standards, so also may it have a bearing on the efficacy of hormonal therapy and explain anomalies in the acid phosphatase figures since this enzyme is a product of adult cells.

Various changes take place in the human organism as a result of oestrogen ingestion. The breasts enlarge and become irritable and oedema, particularly of the lower extremities may be troublesome. The changes in the neoplastic gland are most impressive in the responsive case. Death and destruction are suggested by the state of the malignant cells. The nuclei are small, irregular, pyknotic and fragmented and the cell membrane has disappeared. The arrangement is irregular and bears no relationship to the acinar structure found in the untreated growth. This

picture is so impressive as to warrant hope that more permanent control will be achieved when missing factors are added to the therapeutic equation.

Some recent investigations are worthy of brief mention. Dobriner (1947) and his associates at the Memorial Hospital, accepting a relationship between tar carcinogen and sex hormones have devoted much attention to a search for similar substances in the urine of cancer patients. They estimated the four steroidal substances which are present in the normal male urine, two derived from gonadal sources and two from the adrenal cortex. They found in patients with carcinoma of the prostate the two former to be greatly diminished and the two of adrenal cortical origin greatly increased with the addition of a third steroidal compound also from the supra-renal. This latter substance possibly never occurs in the urine of healthy people and, while found very commonly in patients with many types of cancer, is not quite a constant feature. It may be carcinogenic in nature or a metabolite of cancer growth. Further investigations in steroidal pathology are obviously necessary. At this stage one paradox is very evident. In prostatic cancer the small quantities of steroids of gonadal origin in the urine suggest an almost entire lack of testicular function and makes one wonder why castration should confer any benefit.

Deming (1949) and his colleagues have studied the behaviour of the growth when transplanted to laboratory animals. They succeeded in growing prostatic cancer in the eyes of guinea pigs through 16 successive generations. In the first 8 generations the growths only "took" in male animals unless androgens were given to the female hosts and the importance of androgen in maintaining the neoplasm thus proved. After the 8th generation the transplants grew equally well in guinea pigs of either sex and had apparently become completely autonomous, uninhibited by oestrogens and independent of androgens. This complete autonomy is analagous to that acquired by prostatic cancer in the human in that after a period of treatment growth function gains momentum and is unaffected by any alteration in the hormonal background.

Some light was shed on the production of serum acid phosphatase. In the third generation of heterologous transplants, its absence was proved by the fact that none of the cancer cells took the Gomori stain. In human patients, after hormonal therapy, the serum content often remains low despite an actively progressing tumour and Deming's work would appear to confirm the fact that a change occurs in the chemical characteristic of the cancer cell, apart from confirming the acquisition of a tolerance towards oestrogens. In other words the cancer may achieve an independence, due to an altered chemistry.

Pearson, at Sydney Hospital, has made a preliminary study of blood sedimentation rate in patients with cancer of the prostate, but although he has found an increased figure in the majority of these patients, the presence of infection in benign cases similarly alters the sedimentation rate. The study is not sufficiently advanced for any conclusions to be drawn as to its diagnostic value in doubtful or occult carcinoma.

CONCLUSIONS.

Because of the high incidence of cancer of the prostate its management merits our closest attention. The growth progresses until the death of the patient unless removed surgically and this is possible only in about one patient in twenty. Marked improvement of these figures cannot be expected owing to the insidious onset of the disease and even were this possible cure is achieved by a mutilating operation, not infrequently followed by distressing incontinence.

Temporary relief, none the less impressive and clinically satisfying despite the fact that it is not curative, can be realised in most patients by hormonal therapy, an approach which has engendered an optimism and confidence, quite unwarranted on scientific analysis. The rationale is obscure, the response speculative and the prognosis unassessable with no accurate biological test as a yard stick at any stage. The position must be faced that prostatic cancer may be autonomous from the beginning and although slowed down in its lethal momentum by general systemic influences, which modify the physiology of the host organ, advances inexorably to cause death.

On the other hand, it is possible with a better understanding of the physiology and pathology of the adrenal cortex in particular and the endocrine system in general together with a fuller knowledge of the biochemical background, that the scattered leads may be woven into an overall pattern relating neoplastic cause and effect and pointing to cure.

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THE INVERSION OPERATION IN FEMORAL HERNIA.

By C. CRAIG.
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MY interest in the subject of hernia dates from that period, now twenty-six years ago, when I was at the Melbourne Hospital. At that time the late R. Hamilton Russell used to attend regularly to inspire and instruct whoever would listen to him. Mr. Russell was not a member of the staff of the Melbourne Hospital, but attended by courtesy of some of the members of the staff, notable amongst whom were Mr. John Gordon and Mr. Alan Newton. Russell's influence on the young members of the staff was very great. His main teaching, of course, was on the subjects of fractures and of hernia. I shall never forget one morning when I was operating on a case of femoral hernia. I was just commencing the operation when Hamilton Russell walked into the theatre. He stood watching for some time but said nothing. I felt that I was operating particularly well and was elated at the presence of so great an authority. This feeling of elation continued until the next morning when Hamilton Russell unexpectedly appeared at the hospital. After chatting for some time, he handed me a small pamphlet which he suggested I might like to read. When he had gone, I opened the wrappings and was pleased to discover that the pamphlet was a reprint of his essay on femoral hernia, until I found written in the top right-hand corner, "With the compliments of the pained author." The procedure I had adopted in this operation was that of opening the inguinal canal after the sac had been isolated below and of approaching the neck through the posterior wall of the canal. Mr. Russell's objection to this procedure was that, in the hands of a not very skilful operator, the interference with the posterior wall opened the way to a direct hernia. His method of dealing with femoral hernia was simply to free the sac, twist it, and ligate it as high as was possible from the inferior side of the inguinal ligament. The great disadvantage of this method of operating is that it is impossible to reach the spot where the neck of the sac emerges from the peritoneum. It was this disadvantage that led to the development of the method of operating through the inguinal canal. If, in operating through the inguinal canal, the surgeon limits himself to opening the posterior wall, dealing with the sac, and then sewing up the posterior wall again, this operation is probably a good one. In recent years, however, there has been developed a technique of performing through the canal a complicated plastic operation with the object of suturing tissue on to Cooper's ligament and thus blocking up the opening into the femoral canal. It is quite definite

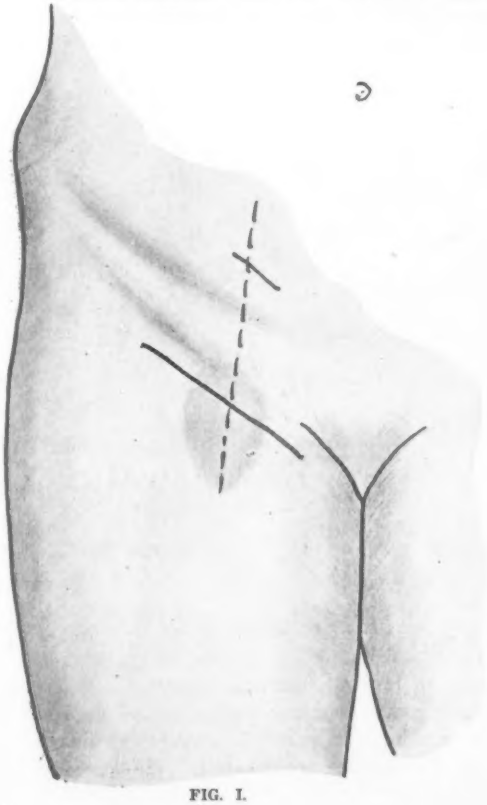


FIG. I.

that this operation can be followed by the occurrence of a direct inguinal hernia, and two cases of such recurrence have been reported to me by surgical colleagues. The operation must, therefore, be regarded as an unsound one.

It was the proven unsoundness of the method of operating through the inguinal canal, together with the difficulty of reaching the neck of the sac from below the inguinal ligament, that led to the application to femoral hernia of the method of inversion of the sac. This method has been used by me in 230 cases of indirect inguinal hernia, and I consider it a much better method of dealing with the sac than that of ligation. The technique, as well as the difficulties, have been fully described in previous papers (Craig, 1948, 1949). As far as its application to femoral hernia is concerned, it has these great advantages—that a good method of dealing with the sac can be combined with complete avoidance of the inguinal canal.

TECHNIQUE.

Step 1.

An oblique incision is made over the sac just below the crease in the groin (Fig. I). The sac is found and is separated from the surrounding tissues up to the opening of the femoral canal. It is then found that the sac is a pear-shaped mass with its stalk disappearing through the femoral canal. The word "sac" has been used but actually the tissue surrounding the pear-shaped mass could be better described as the capsule. The true peritoneal sac lies deep within the mass and separated from it by fat. If the "capsule" be opened, this fat pours out with an appearance very like omentum. There is often such a quantity of this fat that it must be assumed that there has been some growth of it after its displacement by the hernia from its original site.

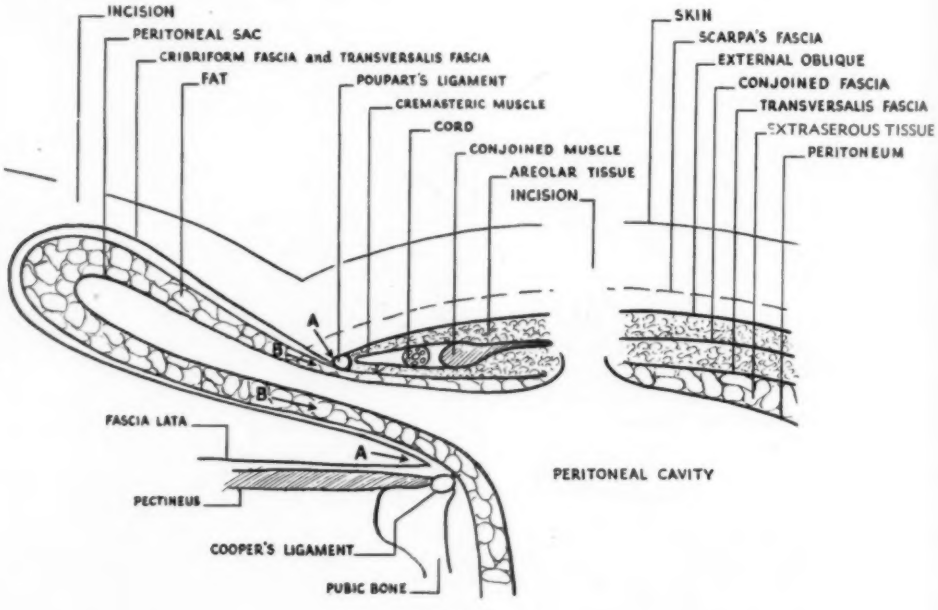


FIG. II.

Special attention must be drawn to the anatomy of that layer of the sac which has been called the "capsule," and it is asked that Fig II be studied. This is based on actual dissection. It will be seen here that the capsule is represented as being made up of the distended fascia cribrosa and of the distended fascia transversalis. By the fascia

transversalis is meant that layer which lies immediately beneath the muscles investing the abdomen and which is separated from the peritoneum by fatty tissue. There can be no question that this layer is continued out into the "capsule" as the connection is very easy to trace and is very obvious. The presence of the fascia cribrosa in the capsule is not so easy to trace. However, the special point is that there is a distinct capsule which is quite separate from the true sac. If Fig. II is again referred to it will be seen that the transversalis fascia as it leaves the abdomen to take part in "the capsule" is attached to both Poupart's and to Cooper's ligaments. This attachment is actually present but it is not a firm attachment and the fascia transversalis can be separated quite easily by blunt dissection from both Poupart's and Cooper's ligaments.

tunnelling in this plane is that the whole mass—sac, fat and capsule—has to be inverted through the femoral ring, and that, when inverted, it is too bulky to be neatly dealt with.

It is probably better to carry out the tunnelling in the plane marked B., i.e., between transversalis fascia and the peritoneal sac. In order to do this, it is first necessary to isolate the sac. An incision is made through the anterior part of the capsule in the long axis of the mass (Fig. III). The sac is then sought for. It is, however, sometimes surprisingly hard to find. If this is the case it is not worth while wasting time looking for it in the ordinary way. Step 3 is carried out at once.

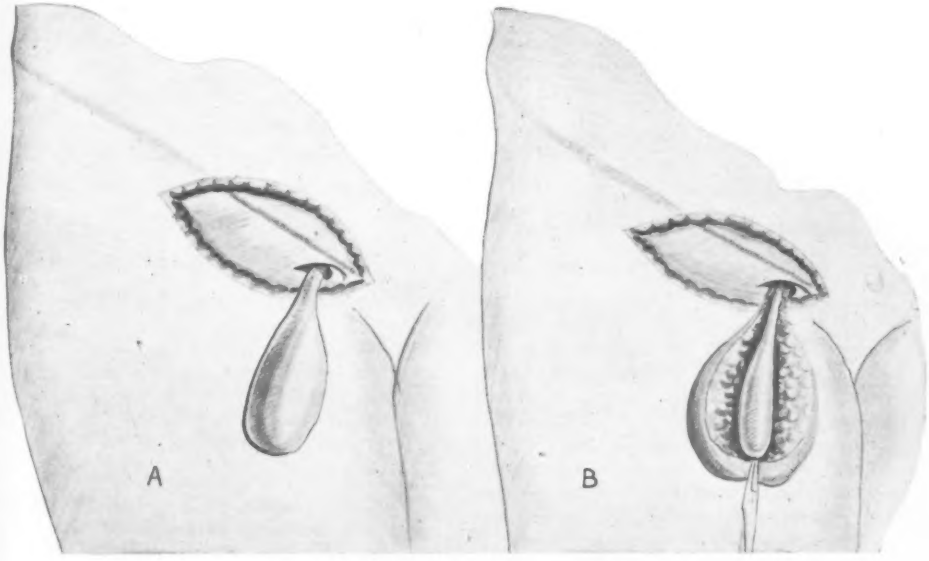


FIG. III.

Step 2.

This consists of a tunnelling procedure under Poupart's ligament. This tunnelling may take place in either of two planes. The first is that represented by A. in Fig. III and lies outside the caspule. The tunnelling is carried out by inserting the end of a blunt dissector and pressing it through to the abdomen right round the circumference of the neck of the sac. The disadvantage of

Step 3.

Another much smaller incision is made as shown in Fig. 1. It is from 2.5 to 3.5 cm. above Poupart's ligament and is so placed that it lies over the outer edge of the rectus muscle. It is deepened through the muscle layers and the peritoneum is opened at the outer edge of the rectus. If the sac has not been found a curved urethral sound is passed through this upper incision and

through the femoral canal, which is easily found, and thus into the sac. The sac is thus easily picked up through the lower incision, forceps are placed on it, and the sound is withdrawn.

The sac is now completely separated from the surrounding fat up to its neck. The tunnelling procedure is carried out as previously described, but in the plane marked B. in Fig. II.

edged needles. A tunnel is made between the peritoneum and the transversalis muscle. The needles are passed through this tunnel and out through the skin in such a way as to draw the sac into the tunnel (Fig. VI).

It was formally my practice to bring the sac out through the muscles. As there was a recurrence in this region on one occasion, the procedure has been altered as indicated.

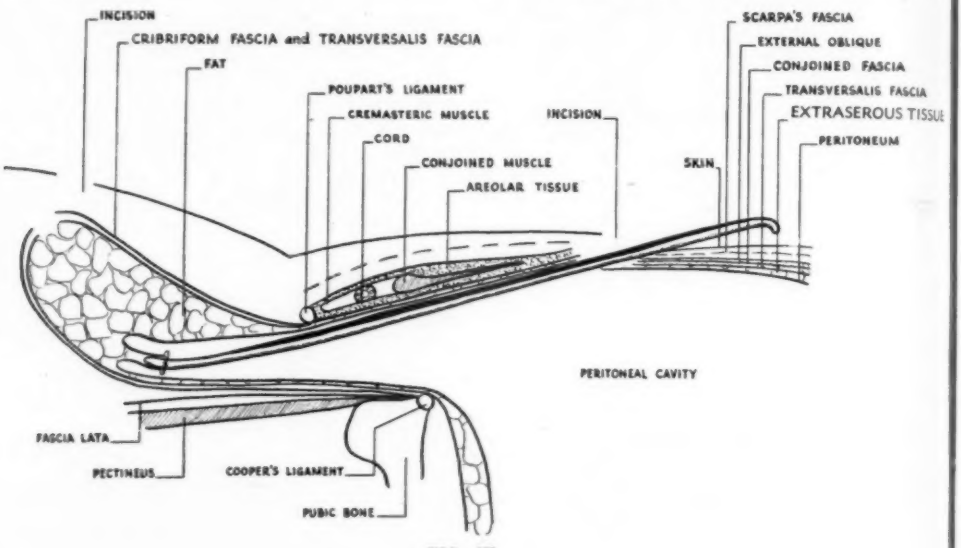


FIG. IV.

Step 4.

Is the process of inversion. The sac is opened at its fundus. The patient is placed in Trendelenberg position. A McCormick's dissector is passed through the sac into the peritoneal cavity and out again through the upper incision. There is a hole in the end of this dissector and as this end comes level with the fundus of the sac, the fundus is sewn to the dissector. As the dissector is pulled out through the upper wound the sac follows it and comes out inverted through the wound (Figs. IV and V).

Step 5.

Is the final disposal of the sac. Using fine chromic catgut as a continuous suture the sac is sewn to the parietal peritoneum which is now completely closed.

A thread suture is now passed through the fundus of the sac. The ends of this suture are threaded on two curved cutting

Step 6.

Unless special repair is intended, the two incisions are now closed in the usual way. It is at present my practice not to proceed further than this step.

Step 7.

If special repair is intended, the upper incision is suitably enlarged. It will then be seen that the process of inversion has developed the extraperitoneal region in the neighbourhood of the femoral canal in such a way that access to Cooper's and Poupart's ligaments is easy. The situation is now that described by Henry (1936), (Fig. VII).

The surgeon can quite easily carry out whatever plastic procedure he thinks fit. So far I have not carried any such procedure as routine. On one occcasion I did so, however, and encountered no difficulty. Fascia was removed from the anterior sheath of the rectus and sewn over the opening into

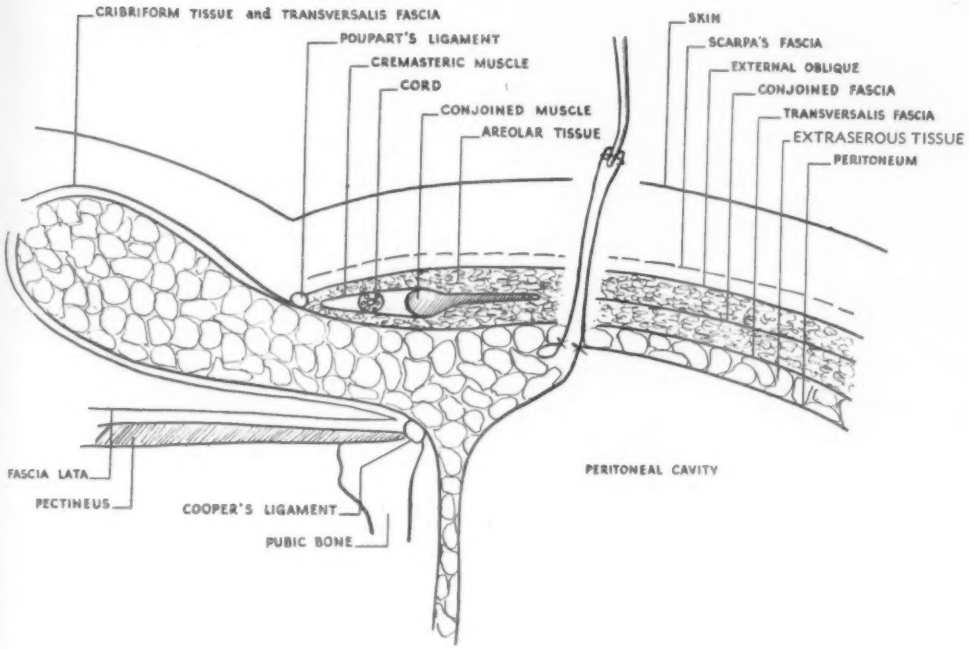
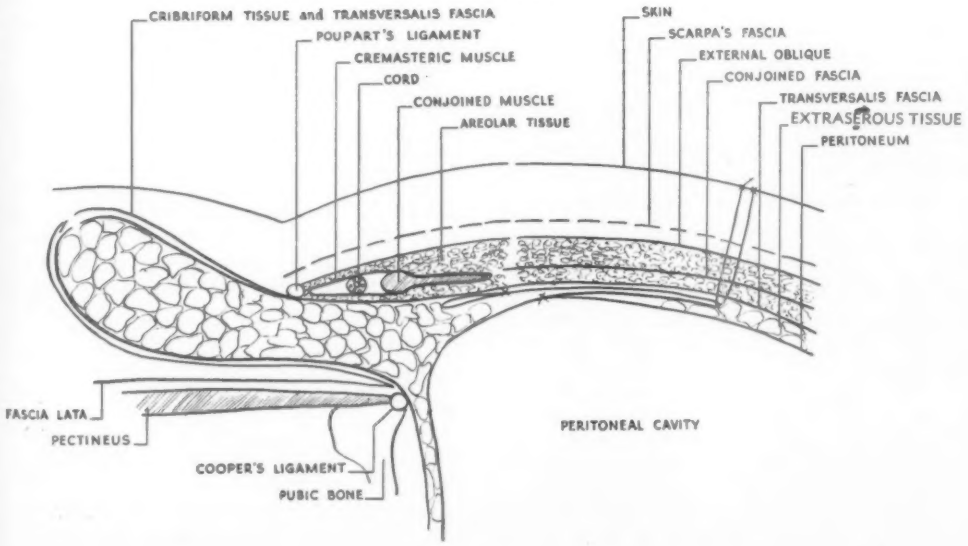

CRIBRIFORM TISSUE and TRANSVERSALIS FASCIA
POUPART'S LIGAMENT
CREMASTERIC MUSCLE
CORD
CONJOINED MUSCLE
AREOLAR TISSUE
SKIN
SCARPA'S FASCIA
EXTERNAL OBLIQUE
CONJOINED FASCIA
TRANSVERSALIS FASCIA
EXTRASEROUS TISSUE
PERITONEUM
FASCIA LATA
PECTINEUS
COOPER'S LIGAMENT
PUBIC BONE
PERITONEAL CAVITY

FIG. V.


CRIBRIFORM TISSUE and TRANSVERSALIS FASCIA
POUPART'S LIGAMENT
CREMASTERIC MUSCLE
CORD
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TRANSVERSALIS FASCIA
EXTRASEROUS TISSUE
PERITONEUM
FASCIA LATA
PECTINEUS
COOPER'S LIGAMENT
PUBIC BONE
PERITONEAL CAVITY

FIG. VI.

the canal. I would consider the transplantation of fascia or skin a much sounder operation than a manipulation of the tissues lying behind the inguinal canal, as the main object of the operation that has been described is the avoidance of interference with the tissues surrounding the inguinal canal.

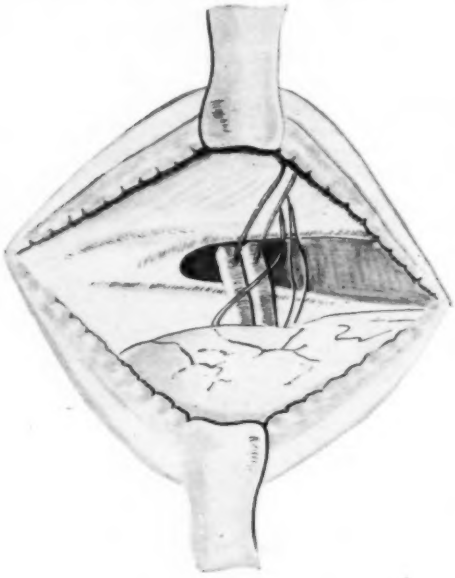

FIG. VII.

There are two comments to be made on this operation. The first is that I find it a much easier operation to carry out than the Lothiesen, and one which can be performed more quickly. The second comment has to do with the suggestion that the whole operation be carried out through the upper operation. I have done this, delivering the sac in the manner described by Henry and then inverting it. My objection to this procedure, however, is that it involves too much interference with the structures lying behind the inguinal canal. When the main part of the operation is done from below and the very small upper incision is used for the inversion procedure only the interference with the posterior wall of the canal is minimal. However, if the surgeon makes up his mind beforehand that he is going to carry out plastic repair, then the whole operation could be done through a longer upper incision.

RESULTS.

Femoral hernia is not common in this part of the world. Counting only cases in which there has been no plastic procedure and in which one year at least has elapsed since the operation was performed, only 10 cases can be presented. In 5 of these, tunnelling was carried out in the plane marked A. in Fig. II, and 5 in that marked B. The cases have been followed up and so far there have been no recurrences.

The question will be asked: "What prevents recurrences?" The femoral ring is surrounded on three sides by structures which cannot yield in the direction of closing the ring. If, in operating on a ventral hernia, such an opening was left unguarded, there would be a recurrence within a short time. The answer to the question is probably to be found in the presence of the femoral vein on the fourth side of the femoral ring. All veins fluctuate greatly in size. If, during any operation in which the femoral vein is exposed, the patient be made to strain, it will be seen that the vein distends markedly. It seems, therefore, highly probable, that it is this expansion of the vein which presses the lateral wall of the femoral canal inwards, converting the canal from an open tunnel to a slit.

SUMMARY.

A method of operating on femoral hernia has been described of which the following are the main features.

1. A tunnel is made round the neck of the sac under the inguinal ligament and interference with the inguinal canal is thus avoided.

2. The sac is treated by the method of inversion. Ten cases are reported without recurrence. It is suggested that, after removal of the sac, the femoral ring is closed by the pressure of blood in the femoral vein.

ACKNOWLEDGEMENTS.

The illustrations were drawn by Miss A. Jacobson, clinical photographer at the Launceston General Hospital.

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ADVANCES IN CARDIO-VASCULAR SURGERY.

By O. Theron Clagett, M.D.

(Division of Surgery, Mayo Clinic, Rochester, Minnesota.)

Introduction.

IT is an honour of which I am fully sensible to address the Royal Australasian College of Surgeons. I deeply appreciate this privilege and I take this opportunity to extend thanks to the Council of the College. I am particularly grateful that the members were so kind as to renew their invitation when circumstances prevented my acceptance of a previous one. Actually it is fortunate for me that this visit was delayed two years because in that time certain advances in cardio-vascular surgery have been made, relation of which probably will render my address more acceptable to you than otherwise it would have been.

The reputation of anyone, and perhaps particularly that of a surgeon is placed in jeopardy if he bases predictions for the future on experiences of the past. In 1839, Maisonneuve stated that surgery had reached its peak. As recently as 1934, Jean Louis Faure predicted that the great days of surgery were over. In 1897 Sir Stephen Paget spoke as follows: "It is sometimes said that surgeons fifty years hence will think as little of our results as we think of their methods of fifty years ago. So far as regards the surgery of the chest, this is utterly untrue. Fifty years ago it had risen above the horizon. It is now nearly at its zenith." And later Paget said, "Surgery of the heart has reached the limits set by nature to all surgery and it is unlikely that any new developments can extend those limits." Boerhaave (1709) dismissed the whole subject of wounds of the heart and pericardium with the statement, "all wounds of the heart are mortal." In 1807, John Bell said, "There is so little to be done and the signs and consequences are so clear that it were a waste of time to speak further of wounds of the heart." Billroth, in 1875, wrote, "Paracentesis of the pericardium is an operation which approaches very closely to that kind of intervention which some surgeons would term a prostitution of the surgical art and other madness," and in 1883 he said, "The surgeon who would attempt to suture a wound of the heart would lose the respect of his colleagues."

Fortunately, surgeons of each generation are so disposed that they can revere the opinions and accomplishments of their great surgical forbears but, at the same time can refuse to believe that things impossible in the past are necessarily impossible in the present and future.

The old order changeth, yielding place to new;
And God fulfills himself in many ways.

Tennyson's lines are exemplified in the progress that has been made through the years in every branch of surgery and particularly in the last decade in cardio-vascular surgery. I shall, therefore, avoid the hazard of making predictions as to the further progress in cardio-vascular surgery. My discussion will be limited, for the most part, to some aspects of the progress that has been achieved and to present status.

Clinical surgeons perhaps have been slow to follow the lead of physiologists and experimental surgeons in the field of cardio-vascular surgery. As far back as 1910, Carrel had demonstrated many of the techniques and possibilities of vascular surgery that only recently have been applied in practice. Clinical utilization of experimental techniques of cardio-vascular surgery had to wait, however, until progress in anaesthesia would permit the necessary operations, until transfusions and other methods of preventing and controlling shock were readily available and, most important, until methods for accurate diagnosis of cardio-vascular lesions in the living patient had been developed.

At present, cardiologists are amazingly accurate in diagnosis of even the most complicated and bizarre cardio-vascular lesions. Electrocardiography, roentgenography, angiocardiography and cardiac catheterization all have contributed immeasurably to their expertness. Probably the most valuable

tools for use in diagnosis of cardio-vascular disease to-day are the roentgen rays. They are required, in one way or another, whenever the need arises, for roentgenograms, roentgenoscopic visualization, angio-cardiography or cardiac catheterization. The last of these, cardiac catheterization, seems the coalescence and embodiment of all the "wisdom, art and skill" acquired by physicians of the past. Their present representative, that "heir of fame," with the casual manner of the well-prepared, easily passes a catheter up the arm, down into the superior vena cava and through the chambers of the heart. Thus he records the pressures in the various portions of the vascular system; thus he learns the oxygen saturation of blood in the cardiac chambers and major vessels. It would be pleasant to discuss all of the various techniques for diagnosis of cardio-vascular disease now available to physicians whom I greatly admire, but the minutes pass, and my subject is surgery.

As has been true of surgery in general, surgery of the cardio-vascular system originated in treatment of wounds. The first successful suture of a cardiac wound was reported by Rehn in 1897. By 1909, Peck was able to collect reports of 160 cases in which 121 different surgeons had operated on wounds of the heart, with recovery of 36 per cent. of the patients. By 1932, the mortality of cardiac wounds treated by surgical repair had fallen to about 30 per cent. In the recent war, surgical treatment of wounds of the heart and great vessels was advanced even further. Harken and his associates (1946) were able to report a remarkable series of 79 cases in which foreign bodies were in or adjacent to the great vessels and 59 cases in which foreign bodies were in or adjacent to the heart—a total of 138 patients subjected to operation without a death. Surgical treatment of cardio-vascular wounds and injuries has become firmly established; and now to review some of its recent applications.

CHRONIC CONSTRICTIVE PERICARDITIS.

In 1898, Delorme suggested that chronic constrictive pericarditis might be relieved by a surgical procedure aimed at freeing of adhesions between the heart and the pericardium. This procedure first was carried out by Rehn in 1913 and he bettered Delorme's suggestion by resecting a portion of the pericardium as well as freeing the adhesions. Working independently in the same year, Sauerbruch (1925) also reported successful partial pericardiectomy. These operations mark the origin of elective cardio-vascular surgery. It is now generally recognized that pericardiectomy is the only treatment of value for chronic constrictive pericarditis whatever its cause.

The etiology of chronic constrictive pericarditis is obscure. Rheumatic fever is believed not to be its basis. In many of the cases in which, with others, I have been concerned, there was no history of significant antecedent infection or, if infection had occurred, it had been mild and had given no indication that pericardial change had attended or followed it. Tuberculosis is considered to be an important aetiological agent and is undoubtedly responsible in some cases, but careful study of the resected pericardium in most cases encountered at the Mayo Clinic has not given bacteriological or histological evidence of the presence of tuberculosis.

This pericardial disease of uncertain cause is of insidious onset but symptoms are progressive. The chief symptoms are dyspnoea, ascites and oedema of the legs. The heart is of normal size or is not significantly enlarged. The blood pressure is low, the pulse accelerated. Rarely are significant heart murmurs detected. The veins of the neck are distended and frequently pulsating. Venous pressure is markedly elevated. In most but not all cases, signs of calcification of the pericardium can be demonstrated in lateral and postero-anterior roentgenograms. On roentgenoscopy, motion of the heart is seen to be markedly restricted. Circulation time is prolonged in most cases. Bromsulfalein tests usually give evidence of impaired hepatic function. Pre-operative efforts to improve function of the liver when it is seriously impaired are very important. Also it is necessary that diagnosis be made early, for reasons which will appear in a moment.

The diagnosis having been made and pre-operative preparation completed, several surgical approaches are available. Most important is it to provide exposure which will allow extensive resection of the pericardium and freeing of adhesions. I prefer primary

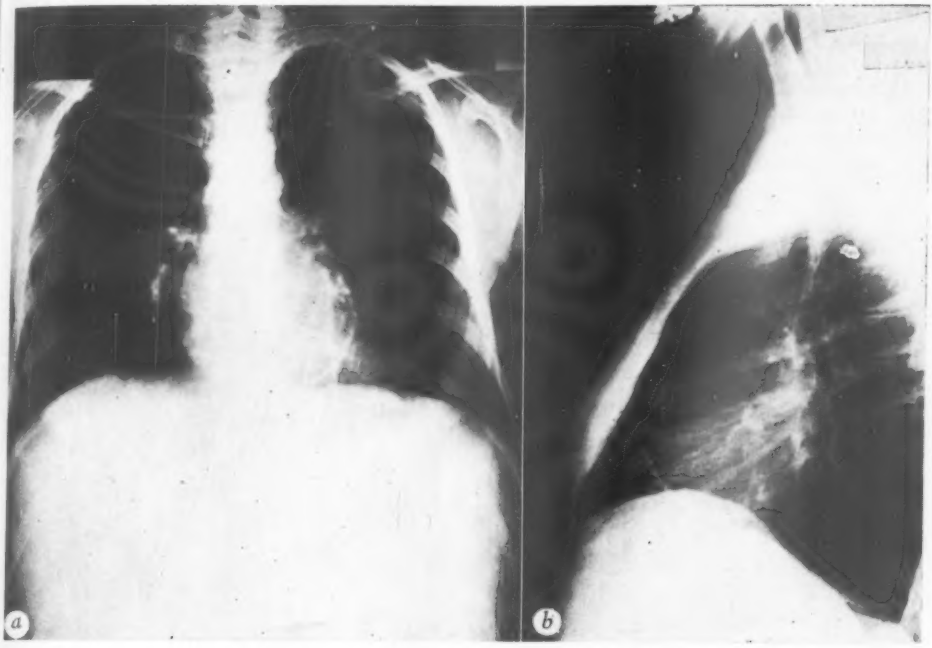

FIG. I. Calcified constrictive pericarditis: (a) antero-posterior; (b) lateral views.

incision in the median line of the thorax, followed by splitting of the entire length of the sternum. Unlike the keel of a ship, fracture of which usually is fatal, the sternum, the keel bone of the body, heals firmly after it has been split and the thoracic wall is not permanently weakened. The approach described gives good exposure, particularly of the most important regions, which are those of both the superior and inferior venae cavae, the right atrium and ventricle, the left ventricle and the apex of the heart.

The outcome in any case depends largely on adequate and early surgical measures. Operation should include resection of the pericardium back to the level of the phrenic nerves on each side at least, as well as thorough freeing of structures around the base of the heart. This done, venous pressure should recede promptly to normal and readings within normal limits constitute an accurate measure of the effectiveness of a given intervention. However, cardiac muscle reacts to disuse as does any other muscle: it becomes weak and atrophic if it cannot work and obviously it cannot work when constricted in the vice-like grip that is a consequence of chronic adhesive pericarditis. One of the serious immediate post-operative dangers of surgical measures therefore, is acute dilatation of the weakened myocardium after it has been freed from constriction. For this reason, no longer is it considered as it was a few years ago, that operation for constrictive pericarditis should not be attempted unless it becomes apparent that the patient will die if something is not done. At present operation is performed as soon as diagnosis can be established. Even patients with active tuberculous pericarditis can successfully be subjected to operation now that streptomycin is available.

If you find what has been said in the past few moments to be consonant with your experience, you will agree that operation must be done before the heart muscle becomes so weakened and atrophic that it cannot tolerate its freedom, that operation must be much more radical than formerly was believed to be necessary and that, if these conditions are met, results of operation are excellent.

CONGENITAL ABNORMALITIES OF THE HEART AND GREAT VESSELS.

Praiseworthy as the work on chronic constrictive pericarditis has been, the most brilliant advances in cardio-vascular surgery in recent years have been made in the field of congenital abnormalities of the heart and great vessels. When most of us here were medical students this subject was passed over lightly. There was nothing to be gained by thorough study of it because nothing could be done for the patients anyway. Now that many of these conditions can be relieved surgically their accurate diagnosis becomes a matter of great importance. Fortunately, accurate pre-operative knowledge of the nature of most cardio-vascular lesions can now be obtained. Patent ductus arteriosus, coarctation of the aorta, anomalies of the aortic arch and congenital cyanotic heart disease, known also as the tetralogy of Fallot, are the more common congenital cardio-vascular lesions for which surgical procedures have been devised. I shall discuss each briefly.

FIG. II.
Cardiac enlargement, prominent pulmonary conus shadow and increased pulmonary vascular markings typical of patent ductus arteriosus.

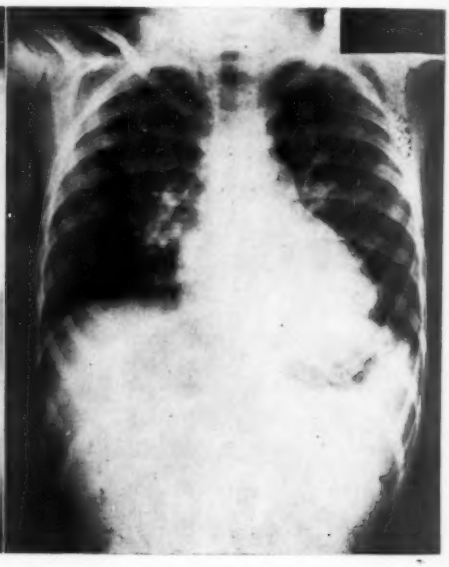

FIG. III.

Patent Ductus Arteriosus.—Patent ductus arteriosus is a vascular connection between the aorta and pulmonary artery which permits shunting of blood from the systemic to the pulmonary vascular system. In this presence, the foregoing definition is given only to satisfy what I conceive to be the canons of exposition. I shall not conform to them sufficiently to afflict you with a review of the pathological physiological changes resulting from the condition under consideration.

This condition has been well known for years. As long ago as 1907 Munro, a pediatrician of Boston, Massachusetts, in discussing this lesion, its signs, symptoms and dangers, stated: "Ligation of the patent ductus arteriosus must be followed by instant and permanent restoration of normal function of the lung and artery." His suggestion that the anomaly be surgically attacked was not applied until thirty-one years later, when operation was carried out by Streider (1938). This operation was unsuccessful but, a few months later, Gross (1939) successfully closed a patent ductus arteriosus. Operations for this abnormality are now common. Gross, in a personal communication, reports recently a series of 380 cases; Scott (1950), of Johns Hopkins Hos-

pital, 180, and many other surgeons have had large experience with this condition. Closure of a patent ductus arteriosus probably is the most perfect operation a surgeon can perform. It is a physiological operation. Without mutilation or destruction of any tissue or organ the patient is relieved of a dangerous condition and is restored to a normal physiological state.

Diagnosis is not difficult in most cases. The characteristic to and from murmur is similar to that made by some machinery. It is heard best in the second and third interspaces on the left but often is transmitted over much of that side of the thorax. A tactile thrill usually is present and is best felt a little below the left clavicle. The symptoms vary, depending on the size of the ductus arteriosus and on the amount of blood shunted from the aorta to the pulmonary circulation. Dyspnoea on exertion may be evident. If the ductus arteriosus is large, the individual may be poorly developed and undernourished. The diastolic blood pressure usually is low and there is a widening of the pulse pressure. Roentgenoscopy reveals enlargement of the pulmonary artery and increased pulmonary pulsations. Patent ductus arteriosus tends to place a strain on both ventricles but it is more pronounced on the left. Enlargement of the left ventricle is of common occurrence, the degree of cardiac enlargement depending again on the size of the ductus arteriosus and the age of the patient; the larger the aberrant vessel and the older the patient, the greater the enlargement. The electrocardiogram may be essentially normal but often shows evidence of left ventricular strain. Cardiac catheterization may be necessary to confirm the diagnosis in questionable cases. This will reveal increased pressure in the pulmonary artery, and blood withdrawn from this vessel is of higher oxygen concentration than that of blood withdrawn from the right ventricle. Angio-cardiography may demonstrate the presence of a patent ductus arteriosus but is not a necessary diagnostic aid.

According to Shapiro and Keys (1943), the average age at death of individuals with patent ductus arteriosus if it is not surgically corrected, is 25 years. While some persons may live a normal span of years without serious difficulty, 65 per cent. of them will die as a result of the anomaly and its complications. The mortality of operation for closure of a patent ductus arteriosus is about 1 per cent. Occasionally a patent ductus arteriosus will close spontaneously in the course of the first three years of life and, for that reason operation usually is not advisable before that age. Thereafter, there can be little question but that the operation is justified. Moreover if the ductus arteriosus is large, and evidence of cardiac enlargement develops, operation should be undertaken before the patient is three years of age. The period between 3 and 12 years of age is the optimal time for operation. For patients beyond 20 years of age, the risk of operation is increased considerably because of shortening of the ductus arteriosus and loss of elasticity of tissues.

In operating for the condition, some surgeons prefer an anterior thoracic approach. An increasing number of them, however, have discovered the advantages of the postero-lateral incision and I much prefer it. The postero-lateral approach provides better exposure, it avoids mutilation of the breast region and the incision is easier to close. This is particularly important since patent ductus arteriosus occurs two or three times as frequently among females as among males.

The greatest controversy remaining in the management of patent ductus arteriosus regards the method of surgically occluding the aberrant vessel. Gross (1944) reported recanalization of the ductus arteriosus in almost 10 per cent. of cases in which simple ligation was done and, as a result, he developed a technique for complete division of the ductus arteriosus with closure by suture of the aortic and pulmonary ends of the structure. Wangensteen (1947), Potts (1949) and Jones (1947) have supported this procedure as preferable to ligation. Blalock (1946), Murray (in a personal communication) and the group at the Mayo Clinic have not experienced any difficulty from recanalization after ligation of the ductus arteriosus and prefer this technique. Blalock (1946) described a method in which ligatures, placed at the aortic and pulmonary ends of the ductus arteriosus, are tied down and then transfixion sutures are run through the ductus arteriosus, between these ligatures, and tied down firmly. I

believe this technique is easier and obviously safer than the more dangerous division.

Coarctation of the Aorta. — Coarctation of the aorta, as all here very well know, is that condition in which the descending arch of the aorta, in the region of the ductus arteriosus, is more or less abruptly narrowed, constricted or obliterated. The result of this mechanical obstruction of the aorta is hypertension above, and hypotension below, the site of it. Morgagni is credited with the first description of this anomaly, having reported a case in 1760. Until 1944, the literature on coarctation of the aorta was concerned almost entirely with pathologic aspects of the problem. In that year, Blalock and Park reported some investigations which suggested the possibility of surgical attack on the condition. In the fall of 1944 Crafoord, in Sweden, performed the first operation for relief of coarctation of the aorta and, in 1945, Gross and Hufnagel reported on their experimental and clinical work on this condition. A considerable number of operations for coarctation have now been performed by a number of surgeons and, although the patients have not been followed long enough for accurate evaluation of the end results, thus far the benefits are encouraging.

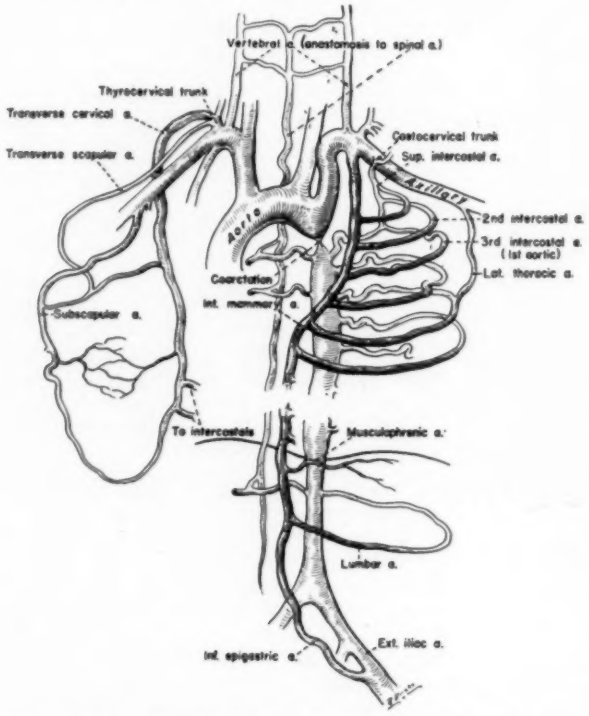

FIG. IV. The pathological lesion of coarctation of the aorta and the main channels of collateral circulation.

The common opinion that coarctation is so rare that it does not warrant serious consideration is not tenable. Statistical studies indicate that it occurs in about one in every 2,000 of the population of the United States of America. It can be conservatively estimated, therefore, that about 75,000 of my fellow citizens harbour the condition. For some unknown cause, whereas patent ductus arteriosus occurs among females two to three times as frequently as among males, coarctation occurs among males two to three times as frequently as among females.

It is paradoxical that although the diagnosis of coarctation of the aorta is not difficult, it is rarely made. Of a series of 96 cases of coarctation encountered at the Mayo Clinic, where there was particular interest in the condition, the diagnosis had been made prior to registration of the patients there in only 11.5 per cent. In these days, when there is an increasing tendency to rely on expensive and complicated laboratory determinations for diagnosis it is appropriate to point out that coarctation can be accurately diagnosed, or at least strongly suspected, by the use of a sphygmomanometer, a stethoscope and one's fingers. The finding of elevated blood pressure in the arm always should initiate measurement of the blood pressure in the legs and palpation of the abdominal aorta and femoral vessels. If the blood pressure in the legs is decreased and the pulsations of the abdominal aorta and femoral vessels are decreased or absent, the diagnosis of coarctation is made. Further evidence of coarctation is the presence of

extensive over-developed collateral circulation between the upper and lower portions of the body. This is most marked in the region of the shoulder blades, where large pulsating vessels may be palpable. Positive evidence of over-developed collateral circulation was found on physical examination in 82.4 per cent. of cases at the Mayo Clinic. Electrocardiographic findings in the presence of coarctation are not usually significant. Roentgenographical evidence of coarctation is provided particularly by evidence of notchings or scalloping of the ribs. This is most marked in the fourth, fifth and sixth ribs posteriorly, and is attributable to erosion of the ribs by the dilated tortuous inter-costal arteries. This sign has been noted in examination of children as young as 5 years of age but it was found in examination of only 43 per cent. of Mayo Clinic patients less than 20 years of age. The aortic bulb may be small or absent. There is usually some enlargement of the left ventricle. Angiocardiography is a useful method of study but is not necessary for diagnosis. Where I work we have measured the pre-operative degree of coarctation and the changes in circulation resulting from operation by keeping records of the blood pressure and pulse waves as represented in the radial and femoral arteries. These quantities have been obtained by inserting into these vessels needles connected to electronic strain gauges.

Operation for coarctation is justified because of the very serious dangers that exist if the condition is not relieved. The average age of untreated persons at death is 30 years. Only about a fourth have lived satisfactorily into adult life. A fourth of the patients have died from bacterial endarteritis, a fourth from rupture of the aorta or of a cerebral artery and a fourth from heart failure owing to the hypertensive state.

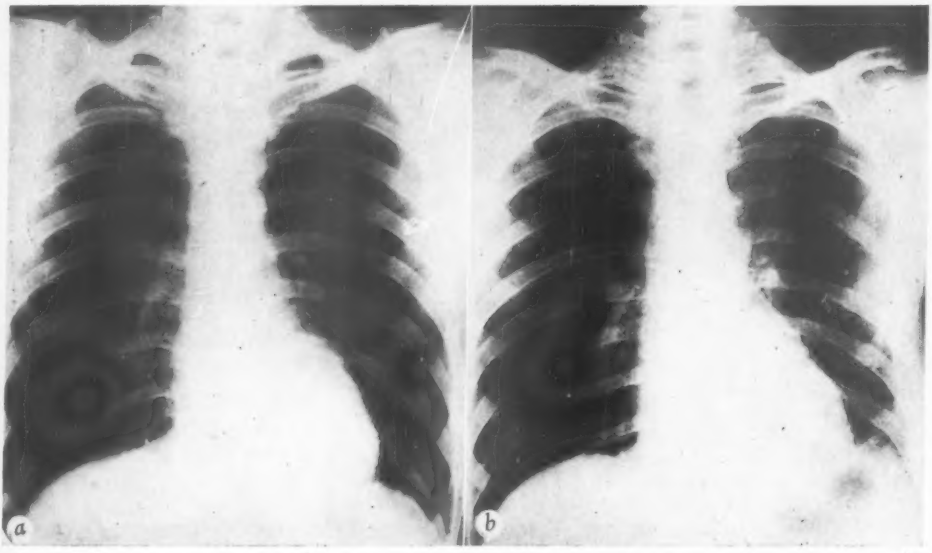

FIG. V. (a) The absence of shadow of aortic knob and notching of ribs typical of coarctation of the aorta; (b) post-operative view.

The optimal age for operation has not been established. However, some experimental work suggests that if vascular anastomosis is performed on an animal before it reaches its full growth, the site of anastomosis does not grow in proportion to the rest of the vessel. This implies that operation for coarctation should be deferred until the patient has attained almost to full growth. Otherwise, an operation that had provided a blood vessel with lumen of satisfactory diameter for a child, might result in some degree of coarctation in an

adult. On the other hand, operation should be performed before severe vascular damage has taken place. I believe 15 to 20 years of age is optimal. However, at the Mayo Clinic we have not denied patients operation merely because of age. Many of our patients have been older than 30 years. On the other hand patients who give histories of, or evidence of cardiac failure or of cerebrovascular accidents, and patients whose roentgenograms disclose the presence of aneurysmal dilation of the aorta, are not good risks for an operation as serious as that needed for coarctation.

FIG. VI.

Fig. VII.

Tissue removed at operation for coarctation of aorta showing degree of obstruction.

The operation of choice consists of resection of the strictured segment of aorta, followed by end-to-end anastomosis. In a very few cases in which this was technically impossible, I have mobilized the left subclavian artery, ligated the distal end, sectioned the vessel and rotated its proximal portion for end-to-end anastomosis with the aorta distal to the site of coarctation. This is not as satisfactory a procedure as end-to-end anastomosis of the resected aorta but it has given some satisfactory results. Gross (1950) recently has developed an aortic graft to bridge the defect when a long stricture of the aorta prohibits primary end-to-end anastomosis. The aortic graft is obtained under sterile conditions at post-mortem examination, preferably within four or five hours after death. Grafts are preserved for periods up to one month in a tissue culture medium at about 4°C. Gross and Ware (1946) have reported six cases in which such grafts have been used successfully. Experience with other types of tissue grafts has not been encouraging. If further experience with blood vessel grafts confirms these early successes reported by Gross, the blood vessel bank may take a place beside the blood bank in the surgical armamentarium.

Not enough patients have been operated on and followed over a time sufficient to permit accurate evaluation of results. The vascular damage resulting from prolonged hypertension may be so severe that some patients will suffer from vascular changes in the future. It seems likely that restoration of normal blood pressure and blood flow will be beneficial. The results thus far are encouraging. The mortality of operation at present is only about 5 per cent. If the medical profession can be alerted to the problem of coarctation and can establish the diagnosis so that operation can be performed at the optimal time, results should be satisfactory.

Anomalies of the Aortic Arch. For many years pathologists have been interested in anomalies of the aortic arch. Only recently, however, has their clinical significance been brought to attention. Although only a few years have elapsed since Gross performed the first operation for relief of oesophageal and tracheal obstruction owing to anomaly of the aortic arch, by now a considerable number of such operations have been performed. It is becoming apparent moreover that these anomalies are not of uncommon occurrence. Pathologists report that they occur in 0.5 per cent. of the population of the United States of America. The possibility of this condition should be considered, therefore, when any infant or child has difficulty in breathing or eating.

Diagnosis can be made roentgenoscopically with the finding of a smooth constriction of the oesophagus at the level of the

aortic arch. If lipiodol has been injected into the trachea, constriction of the trachea at the same level may be revealed. On bronchoscopy, also, narrowing of the trachea at the level of the aortic arch, and pulsation of the aortic ring may be evident. Angio-cardiography also may be used to demonstrate this anomaly. At least sixteen varieties of anomaly of the aortic arch have been described and to make pre-operative diagnosis of the exact type present in a certain case may be impossible.

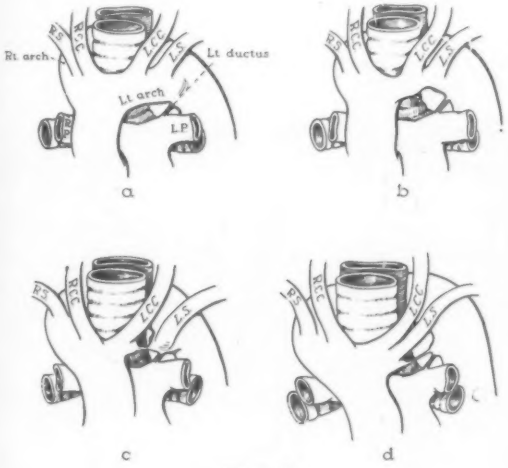

FIG. VIII.

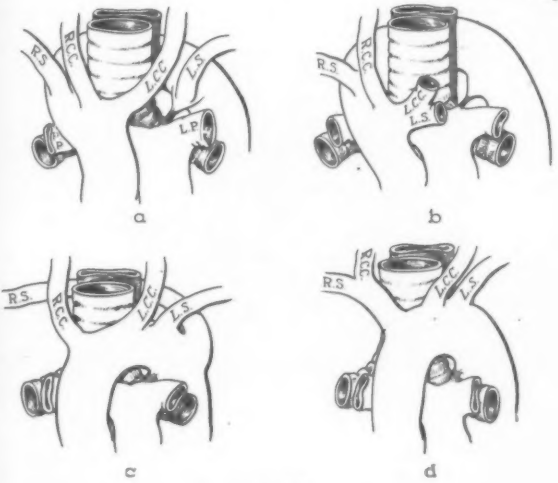

FIG. IX.

Various types of anomalies of aortic arch that can cause tracheal and oesophageal obstruction.

After the diagnosis has been established, surgical operation offers the only effective treatment. Either an anterior or a postero-lateral incision can be used but the approach should be from the side on which the aorta descends. That is, if the aorta descends on the right, as it does in approximately 20 per cent. of cases, incision is made on the right. If the aorta descends on the left, incision is made on the left. The operation should aim at breaking up the aortic ring by division of the smaller of the aortic arches, division of the ligamentum arteriosum, and mobilization of the great vessels, so that the trachea and oesophagus are entirely free of compression. The operation may be difficult but the results are rewarding. Operation should be performed early because prolonged constriction results in permanent weakening of the tracheal cartilages and narrowing of the trachea.

Congenital cyanotic Heart Disease.—The development of an operation for relief of pulmonary stenosis and for the condition that results from the tetralogy of Fallot by Blalock and Taussig (1945), is one of the most dramatic achievements in the history of surgery. You will recall that the tetralogy of Fallot consists of the following: defect of the interventricular septum, pulmonary stenosis, hypertrophy of the right ventricle and an overriding aorta. It required rare perception to conceive that an operation for such conditions might be possible and rare surgical skill to execute it so well. Their work banished the defeatism that prevailed generally regarding congenital heart disease. It opened up new lines of thought and research. It stimulated fundamental investigations that will lead to greater knowledge of the embryology, physiology and pathology of the entire cardio-vascular system.

The object of the operation for congenital cyanotic heart disease is establishment of an increased flow of blood through the pulmonary artery. The Blalock-

Taussig operation accomplishes this by anastomosis of the end of a systemic vessel, usually the subclavian artery, and the side of the pulmonary artery. The Potts (1946) procedure accomplishes the same purpose by making side-to-side anastomosis between the aorta and the pulmonary artery. In carefully selected cases of pulmonary stenosis, Brock (1949) is attempting direct attack on the region of obstruction. The aim of all these operations is the same, to provide an increased flow of blood to the lungs so that more blood can be oxygenated. Obviously, these operations are of no value in cases in which the existing condition is owing to something other than inadequate pulmonary circulation.

developed, it is possible for the cardiologist to make an extremely accurate diagnosis in most cases, and the surgeon can proceed to operation with definite foreknowledge of the lesion with which he has to deal.

The optimal age for operation is from 3 to 10 years. However, children of less than 3 years should have the benefit of surgical treatment if it appears that they may not survive until 3 years of age; moreover, patients older than 10 years should not be denied operation if their lesion is of a type amenable to surgical relief. Most surgeons prefer cyclopropane and oxygen, or ether and oxygen, as anaesthetics. The concentration of oxygen must be as high as possible throughout, since the patients

FIG. X. (a) and (b). Oesophageal narrowing due to aortic arch anomaly.

Selection of patients for operation is the responsibility of the cardiologist, and a serious responsibility it is. Fortunately, with the diagnostic methods that have been

constitute poor surgical risks at best. It is a tribute to developments in anaesthesiology that operation on these patients can be performed at all.

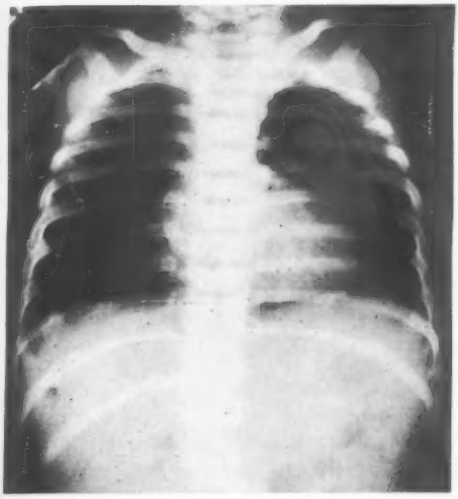

FIG. XI. Cardiac silhouette typical of tetralogy of Fallot.

An anterior thoracic approach through the second or third interspace usually is employed. The postero-lateral incision is preferred by some surgeons, however, and is of course preferable if the Potts type of side-to-side anastomosis between aorta and pulmonary artery is to be performed. As was implied when speaking of cases of anomaly of the aortic arch, it is important to know before operation whether the aorta descends on the right or the left. Again in about 20 per cent. of cases it descends on the right and in the remainder on the left. The side of descent can be determined best by roentgenoscopic examination of the oesophagus as the patient swallows a barium mixture. The curve of the oesophagus to right or left will indicate the side of aortic descent and the innominate artery, of course, will be on the other side. Blalock (1947), prefers to make his approach from the opposite side to that on which the aorta descends so that he can use the subclavian branch of the innominate artery. Because the left subclavian artery and left pulmonary artery are longer and more accessible however, some surgeons prefer an approach opposite to that favoured by Blalock (personal communication).

The operation is difficult. It requires infinitely careful technique. It should not be attempted by a surgeon without experience in vascular surgery.

That congenital cyanotic heart disease is not rare is evidenced by the fact that Blalock has performed more than 800 operations for it and that additional hundreds have been performed by other surgeons throughout the world. Of the first 500 patients on whom Blalock operated, 99, or almost 20 per cent., died in hospital. However, in uncomplicated cases, in which his standard operation was possible, the mortality rate was less than 10 per cent. Only 21 patients of the first 500 died in the course of anaesthesia or operation. When one considers the magnitude of the operation, and the condition of the patient on whom operation was being attempted, this is a remarkable record.

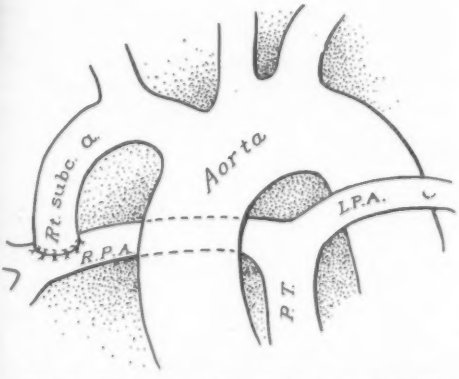

FIG. XII. Blalock operation for tetralogy of Fallot.

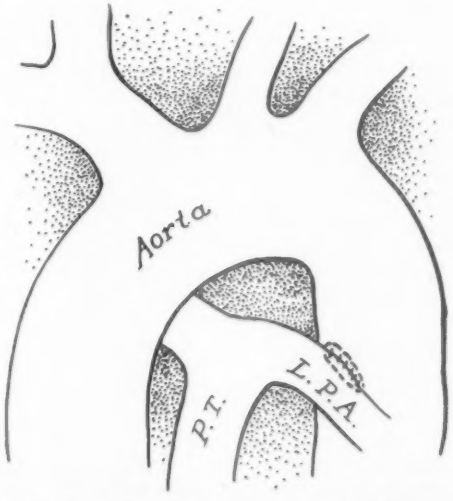

FIG. XIII. Potts' operation for tetralogy of Fallot.

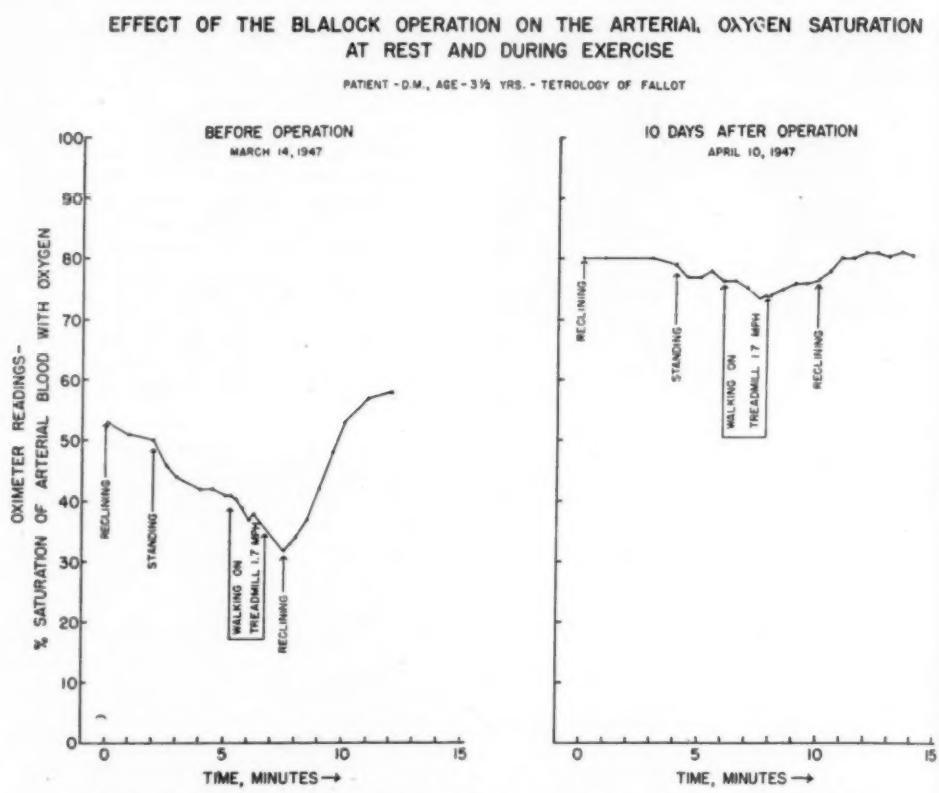
EFFECT OF THE BLALOCK OPERATION ON THE ARTERIAL OXYGEN SATURATION AT REST AND DURING EXERCISE
PATIENT - D.M., AGE - 3½ YRS. - TETROLOGY OF FALLOT
BEFORE OPERATION
MARCH 14, 1947
10 DAYS AFTER OPERATION
APRIL 10, 1947
OXIMETER READINGS - % SATURATION OF ARTERIAL BLOOD WITH OXYGEN
RECLINING
STANDING
WALKING ON TREADMILL 1.7 MPH
RECLINING
TIME, MINUTES →

FIG. XIV. Oxygen saturation of arterial blood before and after Blalock operation for tetralogy of Fallot.

No one knows what the long-term results of operations for congenital cyanotic heart disease will be. Only five and a half years have passed since the first operations were done and not enough patients have been followed over a sufficient time for accurate evaluation. This operation cannot be compared with operations for congenital lesions such as patent ductus arteriosus or coarctation of the aorta, whereby it is possible to restore the patient to physiologic normal. Patients with cyanotic heart disease still have their physiological and anatomical abnormalities; they even have an added abnormality which is equivalent to patent ductus arteriosus. However, the immediate results in cases in which satisfactory anastomosis has been accomplished are gratifying. The child is transformed from a cyanotic, dyspnoeic, under-developed invalid to a pink, healthy normally developing child. Even if the long-term results should not be all that is hoped for them, the temporary benefit will have been worth a great deal to the patients and their families. And when one considers the knowledge and experience that has been gained from the work that has been done, and the research in related fields that it has stimulated, it must be concluded that Blalock and Taussig have contributed one of the outstanding developments in the history of medicine and surgery.

MITRAL STENOSIS.

The possibility of surgical attack on mitral stenosis has engrossed surgeons for many years. In 1902, Sir Lauder Brunton discussed some experiments that he had performed and some of his ideas about the best approach and the instruments for such a procedure. In 1923 Cutler and Levine reported a case in which they had performed

an operation for mitral stenosis. Allen and Graham (1922), Souttar (1925), and others investigated this problem to some extent.

Recently, Harken and associates (1950), Smithy (1948) and Bailey, Glover and O'Neill (1950), have introduced surgical procedures designed to relieve mitral stenosis. All of their procedures entail direct attack on the mitral valve. Smithy and Harken have resected a portion of the mitral valve. This, of course, has resulted in some mitral regurgitation; such a method, therefore, does not seem as favourable as that described by Bailey and associates. In their operation a purse string suture is placed around the base of the left auricular appendage. The tip of the appendage is resected and the index finger inserted into the auricle. The mitral valve can be accurately palpated. A curved knife is fixed in the curve of the index finger and, with this inserted through the mitral orifice, the orifice is incised until the incision enters the muscular tissue. Bailey and associates term this operation "mitral commissurotomy." It has the theoretical advantage of relieving mitral stenosis without producing serious mitral regurgitation, since none of the valve is removed. Time will have to determine whether the cut edge of the mitral valve will fuse. So far, results reported by Bailey and associates are most encouraging. It appears that at long last an effective operation for relief of some type of valvular heart disease has been accomplished.

In an effort to avoid the hazards of direct operation on the mitral valve, Sweet and Bland (1949) have devised an extra-cardiac shunt operation to relieve the pulmonary congestion that results from mitral stenosis. This procedure requires the making of an anastomosis between a branch of the right inferior pulmonary vein and the azygos vein. Thus, blood from the high pressure region in the pulmonary system is drained into the low pressure azygos vein and pulmonary congestion is relieved. They have reported on a series of six patients for whom this operation has been attempted and who have obtained improvement and symptomatic relief. Patients subjected to this indirect operation have not been observed over a sufficient time to allow conclusions regarding the merit of the procedure to be drawn.

DISEASE OF CORONARY ARTERIES OF THE HEART.

I wish it were possible to announce that an effective surgical treatment for coronary heart disease had been developed. A tremendous amount of work has been done in the attempt to devise some method of increasing the blood supply of the heart when coronary flow is insufficient. Unfortunately, none has been successful. Omentum and pectoral muscle have been sutured to the scarified surface of the heart; talc and asbestos have been sprinkled in the pericardial cavity to stimulate growth of vascular adhesions. The great cardiac vein has been ligated; pericoronary neurectomy has been done; various ways of effecting anastomosis of systemic vessels and the great coronary vein have been attempted. Thus far none of the procedures attempted has offered much encouragement.

THE GREAT HOPES.

If ever it should be possible to construct a mechanical heart-lung system that temporarily could take over the functions of the heart and lungs, there would be practically no limit to the surgical procedures that could be performed on the heart and great vessels. Gibbon (1939) and Dennis (personal communication), in the United States, Jongbloed (1948) in Holland and Björk (1948) in Sweden are all working on such mechanisms, and encouraging progress is being made. The problems involved in the development in such mechanisms are great but apparently not insuperable.

Cardio-vascular surgery not only is a relatively new field of surgery; it is also a new type of surgery. It is physiological surgery, or surgical procedures designed to improve the function of organs that cannot be removed or dispensed with. In the past, most surgical efforts have been directed toward repair after trauma, removal of diseased tissues or excision of tumours. Though my exegesis may be false, the words of St. Matthew come to mind: *If thy right eye offend thee, pluck it out.* Surgeons have done much of that and, to their credit, extirpative surgery has made remarkable progress. Few organs and structures of the body still defy surgical resection although there is still room for improvement in

methods and techniques as the striving for lower morbidity and mortality rates continues.

The greatest opportunities for surgical progress in the future, however, seem to lie in the field of physiological surgery. Together here, we have touched on a few of the advances that have been made in that field. Surgeons always have had vision, faith, perseverance and optimism. They still have them. I have not the vision to predict the future but I have faith to believe that the great days of surgery are ahead.

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MARION'S DISEASE.
OR
BLADDER NECK STENOSIS

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EVERYONE is familiar with bladder neck obstruction due to benign adenomatous prostatic enlargement or to carcinoma of the prostate, but bladder neck obstruction without prostatic enlargement is not nearly so generally recognised or understood. This latter condition I have called "Marion's Disease," although this is strictly speaking not accurate, because Marion was not the first man to describe it. Credit for this goes to Guthrie, who described the condition in 1834, followed by Mercier in 1844 and Civiale in 1850. However, to Marion goes the credit for recording the syndrome and formulating its treatment. He, furthermore, pointed out its congenital basis in many cases. Marion made a brilliant review of the subject in 1933 at the Congress of the International Society of Urology. Accordingly, in deference to his great contribution to this subject, it has been the habit in St. Peter's Hospital to call this condition "Marion's Disease." The term, therefore, covers all these conditions variously described as *Prostatism sans Prostate*, median bar, fibrous bladder neck, fibrous prostate, and sclerosis of the bladder neck.

TYPES OF MARION'S DISEASE.

(1) *Congenital.*

This consists of a stenosis of the internal urinary meatus, due to a hypertrophy of the bladder muscle and fibrous tissue, producing what may be described as a diaphragm across the proximal end of the prostatic urethra with a small hole in its centre which may only admit a lead pencil, whereas normally it should admit the forefinger. Histological examination reveals the diaphragm to be composed of normal muscle and normal fibrous tissue, without any evidence of previous inflammatory reaction (Fig. 1). The underlying prostate is similarly normal.

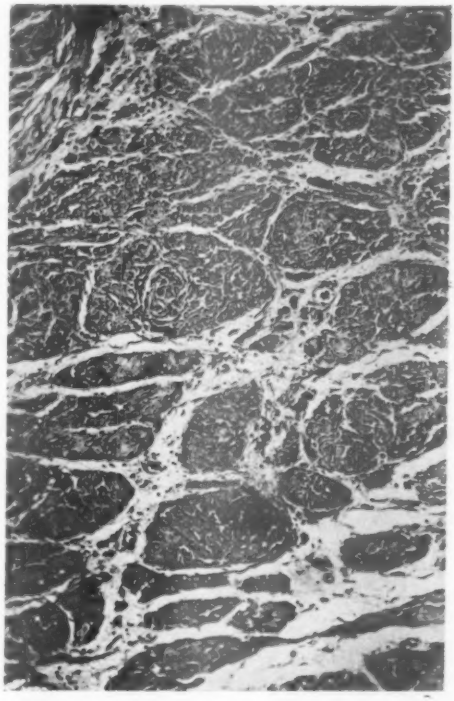

FIG. I. Section of tissue excised from bladder neck of case of congenital Marion's Disease consisting mainly of muscle bundles. (x 200.)

(2) *Acquired.*

This includes the fibrous prostate and chronic prostatitis with marked scarring and narrowing of the bladder neck and prostatic urethra. Here muscle bands are few or absent and the pathological picture is that of gross excess of fibrous tissue with a few prostatic glands interspersed and possible round-cell infiltration.

The condition bears a striking resemblance to pyloric stenosis which is similarly divisable into congenital and acquired, the latter being secondary to duodenal ulceration. The results are also very similar, the chief contrast being that congenital pyloric stenosis usually discloses itself much earlier. Treatment in each case is also comparable.

In St. Peter's Hospital for Stone, from 1935-1948 (excluding the war years) 799 cases of benign prostatic enlargement and 84 cases of Marion's Disease were treated. That the condition is being more frequently recognised and treated is shown by the increased number of admissions in 1947 and 1948 as compared with the previous years. In these two years 49 cases were admitted out of the total number of 84 cases in the whole of the nine years under consideration.

I have reviewed these 84 cases as far as the study of the case notes permits and have set forth the relevant details in Table 1. It will be noted that many headings in this

TABLE 1.

SUMMARY OF CASES OF MARION'S DISEASE ADMITTED TO ST. PETER'S HOSPITAL FOR STONE — from 1935-1948.

Total Number of Cases: 84.	Males 83 Females 1	*Bacteriology of Urine*:	
Average Age: 55.27 years.		Pus	56 cases
Age Groups:		Bacillus coli	41 cases
0 — 10 years	2 cases	Staphlococci	24 cases
10 — 20 "	0 cases	Sterile	7 cases
20 — 30 "	4 cases	*Residual Urine*:	
30 — 40 "	5 cases	Average	10.5 oz.
40 — 50 "	9 cases	Maximum	36 oz.
50 — 60 "	21 cases	Minimum	5 oz.
60 — 70 "	31 cases	*Blood Urea*:	
70 + "	7 cases	*Average* 50.2 mgm. per cent.	
Average Duration of Symptoms: 5.3 years.		Maximum 233 " " "	
Maximum 22 years		Minimum 26 " " "	
Minimum 3 months		*State of Bladder Neck*:	
Previous History of Urethral Infection.:		"Fibrosed bladder neck"	24 cases
Gonorrhoea	11 cases	"Fibrous prostate"	15 cases
Prostatitis	1 case	"Median bar"	8 cases
Epididymitis	1 case	*Aetiology*:	
Periurethral abscess	1 case	Congenital	18 cases
Syphilis	3 cases	Acquired	26 cases
Summary of Symptoms:		Inadequate history	40 cases
Frequency	45 cases	*Pathological Report on Microscopic Section*:	
Pain on micturition	20 cases	Mixed fibrous and muscle tissue	25 cases
Poor stream	27 cases	Fibromyoma	2 cases
Straining to micturate	20 cases	*Treatment*:	
Acute retention	9 cases	Transurethral resection	29 cases
Precipitancy	6 cases	Diverticulectomy + prostatotomy	23 cases
Dribbling	5 cases	Transvesical prostatectomy	8 cases
Incontinence	12 cases	Suprapubic cystostomy	7 cases
Haematuria	5 cases	Prostatotomy	5 cases
Recurrent attacks of cystitis	22 cases	Diverticulectomy	5 cases
Summary of Signs:		*Results*:	
Chronic bladder distension	13 cases	Satisfactory	38 cases
Trabeculation	39 cases	Fair	13 cases
Diverticula	29 cases	Bad	4 cases
Small firm prostate	46 cases	Died	6 cases
Slight prostatic hypertrophy	2 cases	Inadequate evidence	23 cases
Hydronephrosis	4 cases		

table do not include all the 84 cases—e.g., "States of the bladder neck," "Pathological report." This is because these facts were omitted from the notes. However, the table serves as a general survey to emphasise the relevant points.

It will be noted that the age incidence stretches from infancy to old age but the average age is 55 years which is lower than the average age incidence of obstruction due to benign prostatic hypertrophy. The congenital cases may present as babies but frequently these patients do not consult a doctor till after twenty years of age and it is not uncommon for them to present between between 50 and 60 years of age; but they do give a history of poor urinary stream since childhood; consequently it is not possible to label a patient congenital in aetiology solely on account of his age.

It is largely a disease of males but is by no means unknown in females, although there was only one such case in this series.

The symptoms of the condition are protean and may mimic prostatic hypertrophy completely, but they may be divided readily into three main groups.

(i) *Disorders of micturition due to failure of bladder neck to open.*

A poor stream, of long duration, is the most prominent complaint of this group, which, in the congenital case, has been noticed since infancy. Straining to commence micturition also belongs to this group.

(ii) *Disorders due to incomplete emptying of the bladder and back pressure.*

Chronic retention gives rise to such symptoms as nocturnal frequency, dribbling, incontinence, and a feeling of lower abdominal distension and suprapubic aching pain. Sometimes patients state that they have had to make repeated visits to their tailor to get their waist bands let out due to increasing bladder distension.

Back pressure on the upper renal tract may give rise to renal failure, with thirst, anorexia, nausea and constipation; but this, except in children, is uncommon in Marion's Disease at the stage at which the patient presents himself.

A small number of cases present with acute retention. These nearly always have a large diverticulum present, the bladder being unable to force urine out through the stenosed neck due to dissipation of the force into the non-contractile diverticulum.

(iii) *Disorders due to infection in a stagnant urine.*

These cases usually have a large residual urine with one or more diverticula; consequently a fertile culture medium for organisms exists. The patient suffers from recurring attacks of acute cystitis or exacerbation of a chronic cystitis. He complains of frequency, scalding, urgency and sometimes of haematuria. His urine is frequently chronically turbid and offensive.

In the acquired type of this disease, a previous history of infection in the lower urinary tract is obtained, the most frequent offending organism being the gonococcus.

THE DIAGNOSIS.

Contrary to general belief, the diagnosis is easy, provided that a neurological lesion is excluded. It hinges on the presence of the following signs.

(1) A normal or small sized prostate of normal or firm consistency.

(2) Presence of residual urine.

(3) Trabeculation.

(4) Diverticula.

Provided these signs are present, and provided no neurological lesion is present, the diagnosis must be Marion's Disease. The only requisites for making the diagnosis is a reasonably sensitive forefinger, and an examining cystoscope. The use of such special instruments as a retrograde view telescope to visualize the bladder neck is entirely unnecessary.

It is essential that no prostatic hypertrophy be present, either cystoscopically, or by rectal examination. Similarly a carcinomatous prostate must be excluded.

A residual urine, measured at the time of the cystoscopy is usually present but in the presence of an acute cystitis, this may be considerably reduced. It represents failure of bladder emptying.

FIG. II. Multiple calculi in vesical diverticulum.

Trabeculation is always present in Marion's Disease, whether congenital or acquired because it is the outward manifestation of bladder stress. Usually the trabeculation is coarse and prominent as seen through the cystoscope, it may be partly masked, in the presence of the irritable hyperaemic bladder of an acute cystitis.

Diverticula may or may not be present. When a diverticulum is found without associated prostatic enlargement, and this is usually the case, a stenosed bladder neck must be present. It is a sound axiom that the presence of a diverticulum spells bladder neck stenosis until proved otherwise.

Diverticula may be single or multiple, large or small. The commonest situations are in relationship to the ureteric orifices, usually on their lateral aspects. The ureters may open on the lips of the diverticula or occasionally inside them. The presence of a diverticulum should be suspected if the bladder takes a long time to wash clear at cystoscopy, because these pouches form sumps for a considerable amount of bladder debris and are the usual cause for the intractable chronic cystitis associated with these cases.

It is extremely difficult to explore the interior of a diverticulum with a right angle cystoscope as it is more by good fortune than by good management that one is able to guide that instrument through the diverticular neck. However, with a panendoscope, using a fore-oblique telescope it is a relatively simple matter to pass the neck and survey the interior. The importance of this manoeuvre is to exclude the presence of a neoplasm in the depths. Occasionally calculi may be found in the diverticulum. (Fig. II).

FIG. III. Left oblique view of cystogram showing large smooth-walled diverticulum and small trabeculated bladder. Thickness of bladder wall can be gauged from thickness of neck of diverticulum.

X-ray investigation of the bladder by means of a cystogram is a most useful and necessary procedure. The bladder is filled through a catheter with some contrast medium such as diodrast, under the trade name of "Vasidone," and antero-posterior, right and left oblique views are taken (Fig. III). The catheter is then withdrawn and the patient passes all the fluid he can, and further views are taken, and thus the true residual urine is shown together with the degree of emptying of the diverticula (Fig. IV). Not infrequently it will be seen that

FIG. IV. Cystogram after micturition showing residual urine in bladder and in diverticulum.

the diverticula far from decreasing in size, have actually increased because on systole, the bladder contents have partly emptied into the diverticula. The catheter is again passed and all the residual opaque fluid drawn off from the bladder, and further films taken. These now show any fluid remaining in the diverticula which is called the false or concealed residual urine (Figs. V and VI). This full X-ray examination of diverticula is not essential but is of great interest. Small diverticula and those which completely empty themselves do not require treatment, but the large inert fibrous "bags" require excision. The initial cystogram is very necessary, however, to demonstrate the size of the diverticulum and its situation in order that the correct surgical approach may be planned.

An absolute diagnosis of Marion's Disease is at once possible at the operation of cystotomy as pointed out by F. J. F. Barrington. First the bladder wall is unduly thickened, and second, palpation of the internal urinary meatus by the forefinger reveals a grossly narrowed and rigid bladder neck which will admit nothing larger than a lead pencil.

Three further investigations are required preparatory to operative treatment:—

(1) Bacteriological examination of the urine.

(2) Blood urea estimation.

(3) Intravenous pyelogram.

The bladder flora in these cases is that of any ordinary chronic cystitis. Thus bacillus coli is the commonest infecting organism; if a staphlococcus is present it is usually of the albus variety. However, should staphlococcus aureus be found, it is essential that it should be eradicated by chemotherapy before any operative intervention is attempted. Other organisms commonly found are the b. pyocyaneus and b.

FIG. V. Cystogram of patient in acute retention.

FIG. VI. Cystogram after emptying completely with catheter showing "hidden residual urine."

proteus. It is useful at the same investigation to test out the sensitivity of these organisms to sulpha drugs and streptomycin as this information may be required at a later date.

The blood urea is usually low in these cases, but occasionally it may be very high in which case preliminary bladder drainage will be necessary. A high blood urea is more common in children suffering from the disease than in adults, because, in the former, upper tract dilatation and renal damage is more frequent.

FIG. VII. Normal upper urinary tract in patient with acute retention due to congenital Marion's Disease associated with diverticula of bladder.

The intravenous pyelogram is for the purpose of assessing upper tract dilatation and renal function, together with any other abnormalities. Upper tract dilatation in these cases is relatively uncommon and the kidney function is normally surprisingly good (Fig. VII). This fact, together with the low blood urea, is no doubt related to the presence of diverticula which represent bladder "blow-outs." These "blow-outs" are the safety valves of the upper urinary tract taking up the excess bladder tension which would otherwise be relayed on to the kidneys. Thus it is well known (Badenoch, 1948) that the removal of a safety valve, without treating the bladder neck obstruction may cause upper tract dilatation, previously absent, to develop quite rapidly. In the case of children with severe bladder neck stenosis, the diverticula are often small and inadequately developed so that they do not act as safety valves, and consequently the upper urinary tract and renal function suffers in these small patients (Fig. VIII).

TREATMENT.

The principles of treatment of these cases are straightforward.

(1) Removal of the diverticula if present.

(2) Relief of the bladder neck obstruction.

(1) If the diverticula are large, are chronically infected, or do not empty properly, they should always be removed first. It is dangerous to deal with the bladder neck obstruction and leave a large infected diverticulum. Furthermore it is useless to drain a bladder wth a grossly infected diverticulum by a suprapubic cystostomy in the hope of improving the patient's condition and clearing the urine, because the diverticulum acts as a sump which will not drain (Figs. IX and X). Small diverticula which empty well may be left *in situ*.

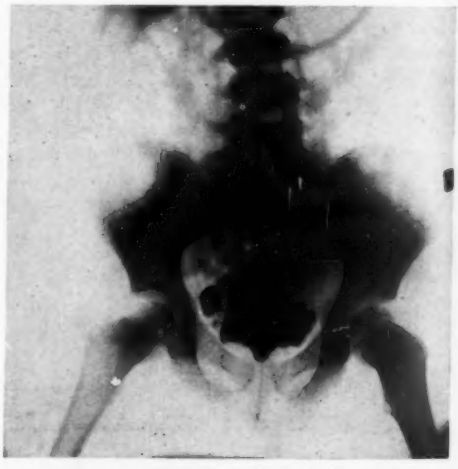

FIG. VIII. Cystogram of child aged 3 years. This patient had severe upper tract dilatation and renal failure.

(2) Conversely it is essential in dealing with diverticula to relieve the bladder neck obstruction either at the same time, or else at a second stage, draining the bladder temporarily in the meantime, until the

patient is fit. To remove the diverticula and leave the bladder neck is to remove the safety valve of the upper renal tract.

The diverticula may be removed by the transvesical method as practiced by F. J. F. Barrington, or the extravesical approach as favoured by R. Ogier Ward. The advantage of opening the bladder is that the bladder neck obstruction can be inspected and dealt with at the same time.

The transvesical approach is excellent for moderate or small sized diverticula and is pre-eminently safe. A 6 or 8 (French) gum elastic urethral bougie is inserted into the ureter. Then the neck of the diverticulum is grasped in tenaculum forceps, cut round, and the whole fibrous lining dissected out with scissors. It is finally lifted out into the bladder like lifting a bottle out of a case of straw. No attempt is made to close the opening in the bladder wall where the neck of diverticulum was; but the bladder is drained by a wide bore suprapubic tube for two to three weeks while the cavity closes in.

FIG. IX. Cystogram showing multiple diverticula. Bladder drained by cystostomy catheter spiggoted.

In the combined approach the urethral bougie is again inserted into the ureter, and the neck of the diverticulum cut free from the bladder wall intravesically. The remainder of the diverticulum is freed extravesically and the hole in the bladder wall sutured. An extravesical drain is put down to the site.

In the extravesical removal, the bladder is partly filled with lotion—it is a mistake to over-distend it as this adds to the technical difficulty—and the diverticulum is dissected free without opening the bladder. The neck of the diverticulum is clamped and divided, and the resulting deficiency closed with a suture. The bladder is drained by an indwelling urethral catheter, and the bladder neck is dealt with at a subsequent transurethral operation. The danger in this operation lies in damage to the ureter, so that it is a wise procedure to pass ureteric catheters cystoscopically before the operation begins. In the open operation urethral bougies are preferable to ureteric catheters because they are larger, more rigid and much more readily palpable.

FIG. X. Cystogram after release of spiggot showing bladder empty but diverticula still full.

The bladder neck may be dealt with in various ways. Where diverticulectomy is not performed and the bladder is not opened a transurethral resection by either the "hot loop" or "cold punch" type of instrument may be used. With the bladder open, a wedge of tissue may be excised from the

bladder neck posteriorly. The diagnosis is checked by passing a finger down to the internal urinary meatus, which will be found rigid and stenosed so that the finger will not enter the posterior urethra as it should do in the normal subject. Accordingly a pair of artery forceps or tenaculum forceps is placed on the posterior lip of the bladder neck and a generous wedge of tissue excised, either with scissors, scalpel, or diathermy current. The adequacy of the removal is checked by passing the forefinger down the posterior urethra to the level of the veru montanum.

Barrington performs a prostatotomy, which is a simple deep posterior mid-line incision of the bladder neck. To do this a Moynihans cholecystectomy forceps is introduced through the bladder neck, the beak reversed, the posterior lip hooked up, the forceps opened, and a deep scalpel cut made between the blades as far back as the interureteric bar. It is interesting to note that, after this manoeuvre, the bladder neck seems to spring open, as though it had been under tension, (as occurs also in a Ramstead's operation) and a finger is readily introduced into the posterior urethra. It is also interesting to note in the congenital cases, using this technique, the diaphragm-like arrangement of the bladder neck, the posterior lip of which is readily hooked up on the cholecystectomy forceps. The stenosis appears to be confined to the internal urinary meatus and the posterior urethra itself appears to be relatively normal in size. This posterior incision is liable to open into extravesical tissue; it it therefore wise to drain the bladder freely for two to three weeks post-operatively.

Marion himself advocates complete excision of the bladder neck, and this method is particularly applicable to the acquired type; i.e., the fibrous prostate. The prostate is coned out, either with scalpel, scissors or diathermy as far down as the veru montanum. He claims that only by so doing is it possible to promote absolutely free emptying of the bladder with reduction of the residual urine to nil. There certainly does seem to be clinical confirmation of this fact in the cases observed at St. Peter's Hospital, and Ogier Ward holds the same view. Transurethral resection "round the clock" does, in effect, perform this coning out, and these cases do very well.

POST-OPERATIVE CARE.

Those cases which have had a diverticulectomy or have been treated by cystotomy should be drained suprapubically for two to three weeks either by a Marion's tube, a Winsbury-White catheter or a de Pezzer catheter initially, depending on the amount of haemorrhage. If an extravesical drain has been used, it is withdrawn on the fifth day. An alternative method is to close the bladder completely and drain via a perineal urethrostomy which, however, is not so safe in the face of much haemorrhage. During the third week urethral sounds should be passed to ensure the patency of the bladder neck, and before the patient is discharged the residual urine should be estimated.

The usual pathological report on the diverticulum is that it is composed of fibrous tissue without any epithelial lining. The report on the tissue removed from the bladder neck in the congenital type of case is that it consists of muscle and fibrous tissue with few or no prostatic glands (Fig. I). In the acquired type of case, the report is that of a fibrous prostate, showing excess fibrous tissue and relatively few prostatic glands. Frequently round cell infiltration is present.

CONCLUSION.

Marion's Disease is an interesting condition, easy to diagnose and easy to treat, provided undue cystoscopic attention is not focussed on the bladder neck. One cystoscopic feature is, however, worthy of note in the patient who is being cystoscoped without any anaesthetic. This is the failure of descent of the bladder neck when the patient is asked to strain to micturate. In the normal patient the posterior lip of the bladder neck should retreat out of the cystoscopic field, whereas in the sufferer from Marion's Disease this fails to occur.

The essential features in the diagnosis of the condition is a history of a poor stream, and the finding of a residual urine, marked trabeculation with or without diverticula, in the absence of prostatic enlargement, always excluding, of course, neurological disease of the bladder.

The treatment is equally clear cut. In the absence of diverticula, transurethral resection of the bladder neck is the treatment of choice; but for the surgeon who does not perform resections, transvesical excision of the bladder neck, or wedge resection or simple prostatotomy should be employed. If diverticula are present they should be excised accompanied by the appropriate treatment to the bladder neck.

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PANCREATIC TISSUE IN THE WALL OF THE SMALL INTESTINE.

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NODULES of pancreatic tissue in the wall of the small intestine have been observed on numerous occasions. Although many nodules are found incidentally during post-mortem examination or operation, in some cases they are the cause of symptoms. It is important that the surgeon who operates on the gastrointestinal tract should not only be aware of the condition, but should also be able to recognize it at operation.

Historical.

The first proven case of pancreatic tissue in the small intestine to be reported in the literature appears to be that of Klob (1859). In 1861 further cases were recorded by Montgomery and by Zenker who found an example situated in the wall of an ileal diverticulum. Other reports included those of Wagner (1862), Nicholls (1900), Ruediger (1903) and Turner (1904).

In 1904 Warthin was able to collect 49 examples of aberrant pancreatic tissue, 19 of which were in the small intestine. Benjamin (1918) reported a case of intussusception due to a nodule of pancreatic tissue in the wall of the jejunum.

Since then numerous accounts have appeared including those of Horgan (1921), Faust and Mudgett (1940), Hunt and Bonesteel (1944), Barbosa *et al.* (1946) and Bustard and Walters (1950).

Case Reports.

Case 1.

A male aged 60 years was admitted to the Royal Melbourne Hospital with a history of having been well until fourteen days previously, when he developed central abdominal pain accompanied by vomiting and constipation. These symptoms fluctuated in severity, but did not subside.

On admission, slight abdominal distension and tenderness were present, and some borborygmi were heard on ausculation. Clinical examination revealed no other abnormality except for a considerable degree of dehydration. A small quantity of flatus was passed during rectal examination. X-ray examination of the abdomen showed a moderate amount of gas in the small intestine and in the colon proximal to the splenic flexure. A diagnosis of incomplete intestinal obstruction was made, and resuscitation therapy instituted.

FIG. I—Case 1: Photograph of a segment of ileum removed at operation from a male aged 60 years. A nodule of pancreatic tissue is situated on the antimesenteric aspect: infolding of the bowel wall, where intussusception had occurred, is apparent. The intestine proximal to the pancreatic tissue is on the left, and is dilated. (Cf. Fig. II.)

Operation was undertaken twelve hours after admission, and, on opening the abdomen, a nodule of tissue 1 cm. in diameter was found about midway along the length of the small intestine. This nodule was obviously lobulated, creamy-yellow in colour, and of firm consistency, and was situated on the antimesenteric aspect of the bowel. Palpation showed that it was projecting into the bowel lumen, but, at this time, no actual obstruction was found. However, an infolding of the bowel wall at the level of the nodule, together with a moderate degree of dilatation proximal to the mass (Figs. I and II), indicated that intussusception had been present. As the intestinal wall at the site of infolding was of doubtful viability, a segment of ileum containing the nodule was resected, and the continuity of the bowel restored by an end to end anastomosis. The nature of the tissue was not recognized at operation. Although the patient's condition showed improvement in the early post-operative period this was not maintained, and death occurred on the tenth post-operative day.

Post-mortem examination showed that the anastomosis was intact, and was situated in the upper ileum. The liver was enlarged and the adrenal glands were grossly wasted in the cortical zones.

There were no other relevant findings, and death appeared to have been due to irreversible biochemical changes following prolonged intestinal obstruction.

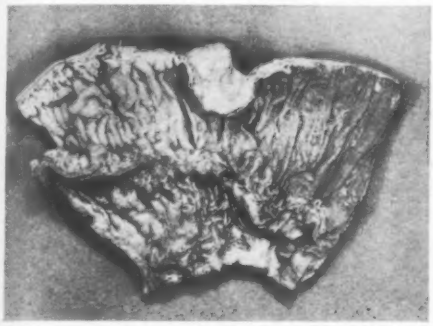

FIG. II—Case 1: Photograph of a longitudinal section of portion of the piece of intestine shown in Fig. I. The pancreatic tissue is projecting into the lumen, and the bowel proximal to the nodule (on the right) is moderately dilated.

Microscopic examination of the nodule in the segment of ileum removed at operation showed that it was composed of typical pancreatic tissue which was situated in the submucous, muscular and subserous layers. Acini, ducts and a small number of islets of Langerhans were present. Ulceration of part of the intestinal epithelium overlying the nodule was found, and there was some supervening inflammation of the adjacent pancreatic tissue.

Case 2.

A male, aged 45 years, died of pulmonary tuberculosis. Routine post-mortem examination revealed a local thickening in the wall of the first loop of jejunum. It partly encircled the bowel wall, and extended into the mesentery (Fig. III). No ulceration was present on the mucosal aspect.

Microscopic examination of the thickened area showed that it was composed of pancreatic tissue.

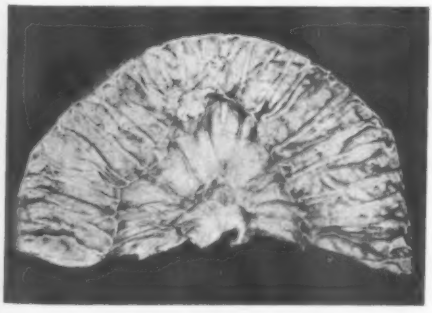

FIG. III—Case 2: Photograph of a longitudinal section of a loop of jejunum from a male aged 45 years. A local thickening, composed of pancreatic tissue, is present in the mesenteric aspect of the bowel.

Case 3.

A male, aged 47 years, died of renal failure associated with malignant hypertension. Routine post-mortem examination revealed a low, pale, lobulated, ovoid elevation beneath the serous coat of the upper jejunum. It measured 4 cm. by 2.5 cm., and lay on the lateral aspect of the bowel (Fig. IV). It showed a lobulated structure.

Microscopically, well developed pancreatic tissue, composed of ducts, acini and islets, was found. Some of the acini were situated in the mucosa where they were in close relationship with the intestinal epithelium. The bulk of the aberrant tissue was in the submucous and muscular coats.

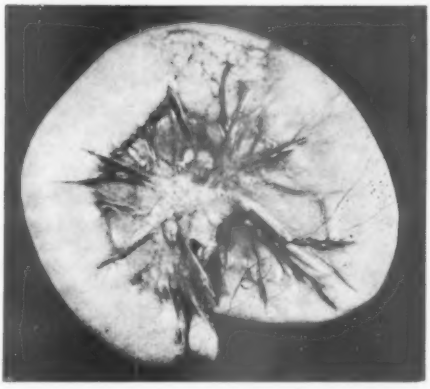

FIG. IV.—Case 3: Photograph of a loop of jejunum from a male aged 47 years showing a plaque of pancreatic tissue on the lateral aspect. Well defined lobulation is apparent.

Case 4.

A female, aged 73 years, died of bronchopneumonia following cholecystectomy for acute cholecystitis. Routine post-mortem examination revealed a pale, lobulated, ovoid plaque of tissue, measuring 4 cm. by 2.5 cm., on the antimesenteric aspect of the first loop of jejunum. The long axis corresponded to that of the bowel (Figs. V and VI). The mass was lobulated, the lobules resembling those of salivary or pancreatic gland.

Microscopic examination showed that the plaque consisted of normal pancreatic lobules with acini, ducts and islets. The pancreatic tissue was situated in the submucous and muscular coats of the jejunum.

Case 5.

A male, aged 63 years, died of cirrhosis of the liver. Post-mortem examination revealed a nodule of firm, greyish-white, lobulated tissue on the antimesenteric aspect of a loop of jejunum (Fig. VII). It measured 2.5 cm. in diameter, and projected into the bowel lumen (Fig. VIII). The lobulated appearance was apparent on the peritoneal surface.

Microscopic examination showed that the nodule was composed of pancreatic acini, ducts and islets which were situated in the submucous, muscular and subserous coats of the jejunal wall.

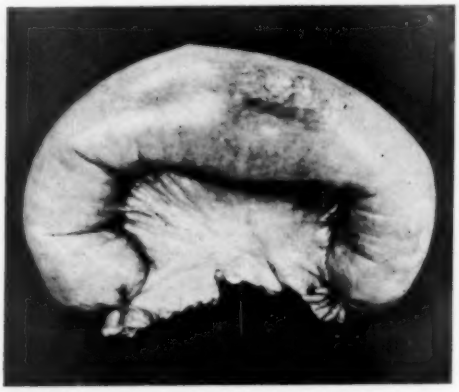

FIG. V.—Case 4: Photograph of a loop of jejunum from a female aged 73 years showing a lobulated, ovoid plaque of pancreatic tissue on the antimesenteric border. (Cf. Fig. VI.)

MORPHOLOGY.

General Features.

Aberrant pancreatic tissue occurs along the length of the small intestine, but has been found a little more frequently in the ileum than in the jejunum. Thus, of 147 cases collected by Bustard and Walters (1950), 85 were situated in the jejunum and 62 in the ileum.

The nodules are found on all aspects of the circumference of the intestine. Of the 5 cases reported here, 3 are antimesenteric in position (Figs. I, V and VII), 1 is laterally situated (Fig IV) and the other is on the mesenteric aspect (Fig. III).

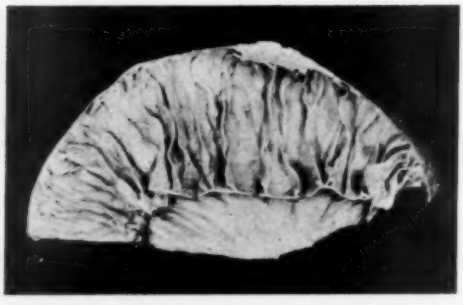

FIG. VI.—Case 4: Photograph of the loop of jejunum shown in Fig. V., here seen in section. The cut surface of the pancreatic tissue shows typical lobulation.

In most cases a single nodule has been present, but, occasionally, multiple nodules have been observed (Branch and Gross, 1935, Zenker, 1861).

FIG. VII.—Case 5: Photograph of a loop of jejunum from a male aged 63 years showing a nodule of pancreatic tissue on the antimesenteric border. Typical lobulation is apparent. (Cf. Fig. VIII.)

Macroscopic Appearance.

Masses of aberrant pancreatic tissue are variable in shape, but are usually in the form of an ovoid (Fig. II) or roughly spherical (Fig. VIII) nodule or a flat plaque (Fig. VI) of tissue. In most cases the size ranges from 1 cm. to 4 cm. in diameter, but larger masses have been observed. Projection may occur under the serous coat (Fig. VII), between the layers of the mesentery (Fig. III), or into the lumen of the gut (Figs. IV and VIII). The tissue is greyish-white or creamy-yellow in colour, and is well delimited from the normal bowel wall. A consistent feature is the presence of lobulation (Fig. VI), although this may not be visible from the external aspect if the pancreatic tissue does not extend into the subserous layer. The consistency is firm, but not hard.

Histological structure.

Aberrant pancreatic tissue is usually composed of acini, ducts and islets which are morphologically similar to those of the anatomic pancreas. However, the proportion of these elements is variable, and one or more may be absent. In addition, the pancreatic tissue may be associated with incompletely differentiated epithelium, or with other glandular elements (e.g., Brunner's glands).

The most common site of the aberrant tissue is in the submucosa, but it may be situated in the muscular or subserous coats, and sometimes more than one layer is involved. Pancreatic tissue may be found in the mucosa in close association with the intestinal epithelium (Case III), and ducts may be observed to pass through the mucosa to open into the bowel lumen.

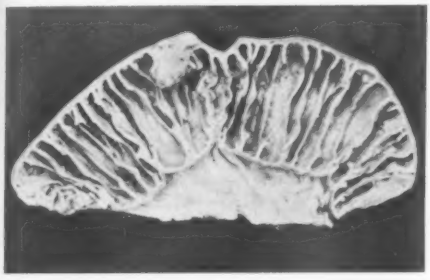

FIG. VIII.—Case 5: Photograph of a loop of jejunum (the same as in Fig. VII) sectioned to demonstrate the projection of the pancreatic tissue into the bowel lumen.

In all of these situations the glandular tissue is intimately mingled with the tissue of the part. This is clearly demonstrable in the muscular coat where the pancreatic lobules lie among the muscle bundles.

Relationship to Diverticula of the Small Intestine.

Pancreatic tissue in the wall of the small intestine is sometimes associated with the presence of diverticula. It may be situated in the bowel wall adjacent to the diverticula as in the case reported by Edwards (1934), but such an association is clearly incidental (King, 1950).

In other cases, however, the pancreatic tissue is found in the wall of a diverticulum. Barbosa *et al.* (1946) collected 129 cases of pancreatic tissue in the small intestine. Of 77 cases in the jejunum, 3 were situated in the wall of a diverticulum, an incidence of 4 per cent. The other 52 cases were in the ileum, and, of these, 25 were in Meckel's diverticula (an incidence of 48 per cent.) and 13 in other types of ileal diverticula (an incidence of 25 per cent.).

Some writers have suggested that aberrant pancreatic tissue may be an aetiological factor in the development of diverticula of the small intestine. Moore (1929) believed that separation of the muscle bundles by pancreatic tissue may lead to weakening of the bowel wall, and the secondary formation of diverticula. Thompson (1908) and others have suggested that the presence of pancreatic tissue in the wall of a diverticulum is sufficient reason to assume that it is not a Meckel's diverticulum, even though the other morphological features are characteristic.

In considering this problem, it is important to appreciate the fact that, during operation or post-mortem examination, nodules of pancreatic tissue in Meckel's or other diverticula are much less likely to be overlooked than small masses not so situated. Thus, the recorded high incidence of pancreatic tissue in the walls of diverticula cannot be accepted as an indication of the true frequency of such as an association. In addition, most diverticula of the small intestine do not have pancreatic tissue, or any other obvious organic lesion, in their walls. Similarly, pancreatic tissue is found frequently in the absence of diverticula. Furthermore, the pancreatic tissue in the walls of diverticula does not always involve the muscular coat, but may be situated in the submucosa (Barbosa *et al.*, 1946), or in the subserous layer (Mitchell and Angrist, 1943, Troll, 1944). For these reasons the hypothesis that pancreatic tissue is an aetiological factor in the development of diverticula appears to be untenable.

Pancreatic tissue in the wall of a Meckel's diverticulum is frequently associated with gastric mucosa. This association has been reported by Bigelow and Clark (1950), Branch and Gross (1935), Taylor (1927), Troll (1944) and others, and occurs in approximately one third of such cases. However, the incidence of gastric mucosa in Meckel's diverticulum is very high, especially when the diverticulum has been the cause of symptoms, and the association of pancreatic tissue with such gastric mucosa is only incidental.

Complications.

The important complications of aberrant pancreatic tissue in the wall of the small intestine are inflammation, obstruction of the intestinal lumen and neoplastic change.

In some cases the inflammation occurs primarily in the pancreatic tissue, as in the case reported by Carwardine and Short (1913) in which acute necrosis and swelling of a jejunal nodule was found. The adjacent bowel wall was congested and oedematous with resultant narrowing of the intestinal lumen.

In other cases it is not possible to determine the importance of the aberrant tissue as an aetiological factor in relation to the inflammatory process. In 1948 de Nicola reported a case, in a male aged 13, with acute inflammation in the wall of a Meckel's diverticulum. The wall of the diverticulum contained a nodule of pancreatic tissue which was involved in the inflammatory process. Since inflammatory changes in Meckel's diverticula in children are not uncommon and usually occur in the absence of pancreatic tissue, the involvement of this may have been, and probably was, only incidental.

Mechanical obstruction of the small intestine is an uncommon complication, and is most often due to intussusception. This may occur in the jejunum (Benjamin, 1918) or ileum (Bosworth and Stein, 1947, MacKelvie, 1949, Ross, 1933, Troll, 1944), but, in a number of cases, the aberrant tissue is situated incidentally in an invaginated Meckel's diverticulum (Barbosa *et al.* 1946, Clarke, 1940, Taylor, 1927, Troll, 1944).

The pancreatic intussusception occurred, with one exception, in older children or adults. Since intussusception is rare, in these age groups, in the absence of some obvious organic lesion, there appears to be no doubt that the nodule of pancreatic tissue was the aetiological factor responsible for the intussusception in these cases. However, the aberrant tissue is probably unimportant as a case of inversion of a diverticulum. Three of the 4 cases of this type referred to above occurred in Meckel's diverticula, and all 4 were in children or adolescents in whom this complication may occur independently of the presence of any abnormal mass of tissue.

Clogg (1908) described a case of intestinal obstruction due to a band which was attached to a nodule of pancreatic tissue at the apex of a diverticulum of the small intestine. Since such bands may occur in the absence of pancreatic tissue, the significance of the latter as a cause of the obstruction is again doubtful.

Narrowing or obstruction of the intestinal lumen may occur as a result of inflammatory changes, as in the case reported by Carwardine and Short (1913).

Neoplasms originating in intestinal pancreatic tissue have been described. Cases in which transition to carcinoma has been observed have been reported by Herxheimer (1913), Seidelin (1912) and Thompson (1908), but there is no evidence to support the hypothesis that carcinoma is more common than in the anatomic pancreas.

Other complications or symptoms have been described in cases with pancreatic tissue in the wall of a Meckel's diverticulum. In some instances the presence of the pancreatic tissue is obviously incidental, as in the case reported by Troll (1944) in which haemorrhage occurred from an ulcer in a Meckel's diverticulum containing gastric mucosa. Hallendorf and Lovelace (1947) reported a similar case in which not only haemorrhage, but also perforation, had occurred.

In other cases, while the pancreatic tissue may have been of some aetiological significance, the evidence often fails to convince. In these, biliousness (Barbosa *et al.* 1946) and symptoms resembling those of appendicitis (Hunt and Bonesteel, 1944, Mitchell and Angrist, 1943, Thompson, 1908) or gastric or duodenal ulcer (Barbosa *et al.* 1946) have been described.

Hyperinsulinism, which has been relieved or improved by the excision of aberrant pancreatic tissue, has been described by several authors (e.g., Smith, 1942), but, in no case so far reported in the available literature, has the aberrant tissue been situated in the small intestine.

Incidence.

Aberrant pancreatic tissue has been found in other abdominal viscera, including the stomach, duodenum, mesentery, omentum, gall bladder, liver and spleen. Bustard and Walters (1950) were able to collect 543 cases from the literature, of which 147 were situated in the small intestine. The aberrant tissue occurred most commonly in the stomach, duodenum and jejunum.

The recorded post-mortem incidence varies greatly according to such factors as the age group examined, and the care and attention to detail with which the examination is carried out. Barbosa *et al.* (1946), from reports in the literature, found that the incidence ranged from .6 per cent. to 5.6 per cent. of cases, and in their own series they found 48 cases in 2,785 post-mortem examinations, an incidence of 1.7 per cent. These authors also estimated that the condition is found once in approximately every 500 operations in the upper abdominal region.

A consideration of both the recorded post-mortem incidence and the total number of cases reported in the literature, indicates that aberrant pancreatic tissue is probably considerably more common than the number of reported cases would suggest. The five cases reported by the writer were found over a period of twenty months.

The age incidence also varies considerably in different accounts. Branch and Gross (1935) reported 24 cases at various sites, and, of these, 13 were under the age of 12 years. However, of the 471 cases collected by Barbosa *et al.* (1946), only 10 per cent. were found in children, and the highest incidence was in the fourth, fifth and sixth decades. The ages of the cases reported in this paper range from 48 to 72 years.

AETIOLOGY.

The problem of the origin of aberrant pancreatic tissue has been discussed in numerous papers. Many writers postulate or support an origin from the primitive pancreas during embryonic life. Variants of this theme include Zenker (1861) who proposed an origin from an additional pancreatic anlage, and Glinski (1901) who postulated non-fusion of one of the normal anlagen. Lateral budding of the primitive pancreatic ducts as they penetrated the intestinal wall was suggested by Warthin (1904), while Horgan (1921) and Lubarsch (1925) adopted the view that, in the presence of adhesions, branching pancreatic buds became engrafted on to other viscera.

There are numerous objections to these hypotheses and very little, if any, evidence to support them. Some of these objections are discussed by King and MacCallum (1934) who point out that, with advancing knowledge of embryology and of the capacity of various tissues to undergo transition into other tissues of a related type, the basis of Cohnheim's cell rest hypothesis disappears. These authors made observations on 4 cases of pancreatic tissue in the wall of the stomach, and concluded that such tissue arose from the epithelium of the stomach and did not arise as a "cell rest" from the displacement of a pancreatic anlage during embryonic life. The reasons for this conclusion were that continuity of the pancreatic tissue with the overlying epithelium was observed in some cases, and that the distribution corresponded to obviously acquired lesions such as gastric ulcer. In addition, the tissue was found mainly in adults, and no morphologic communication with the anatomic pancreas was found. Furthermore, the tissue did not occur as a discrete mass, but was intimately intermingled with the structures in the wall of the stomach.

Nicholson (1923) described continuity between pancreatic tissue in the wall of the small intestine and the overlying epithelium, and considered that the aberrant tissue was due to an abnormal differentiation of this epithelium.

The discovery of pancreatic tissue in the small intestine soon after birth, e.g., at the ages of 8 days and 14 days (Branch and Gross, 1935) and 21 days (Troll, 1944), has been employed as an argument against the hypothesis of local development, but, clearly, changes in the tissue of the bowel, as a result of the action of abnormal stimuli, may occur in anenatal life as in the postnatal period. The observations made in the

cases reported in this paper suport the view that pancreatic tissue in the small intestine arises from the overlying epithelium.

Clarke (1940) and Mitchell and Angrist (1943) have used the term myoepithelial hamartoma which has the serious disability of perpetuating the idea that these masses of tissue are neoplasms. The term also implies that the aberrant tissue arises during embryonic development, and that the muscular tissue forms an integral part of the mass. Thus the use of the term is confusing and misleading, and is to be deprecated.

DIAGNOSIS AND MANAGEMENT.

Pancreatic tissue may be found at operation, incidentally, or as a cause of symptoms. In most cases it should be possible to recognise the nature of the tissue from its similarity to that of the anatomic pancreas. Nevertheless, the condition is frequently misdiagnosed, sometimes because of the situation (e.g., in the submucosa) which may be such that the characteristic structure is not visible from the external aspect, but, more commonly, because the surgeon is not aware of the phenomenon or does not think of it at the time of operation. Many cases are diagnosed as benign tumours, but, in others, the mass is thought to be malignant and unnecessarily extensive operative procedures may be performed. If there is doubt as to the nature of the tissue, examination of a frozen section will establish the diagnosis.

If the aberrant tissue is the cause of symptoms, local excision will suffice in the majority of cases, but complications such as gangrene of the bowel wall due to intussusception or obstruction to the intestinal lumen as a result of extensive inflammatory changes will necessitate more extensive operative procedures.

The problem arises as to the course to be adopted when the pancreatic tissue is found during an operation for some other condition. The decision as to whether or not this aberrant tissue should be excised will depend on a consideration, on the one hand, of the risk to the patient of any additional operative procedure, and, on the other, of the likelihood of complications developing if the tissue is left *in situ*. The risk of local excision of a nodule of tissue from the wall of the small intestine is, of itself, slight, but such factors as the general condition of the patient, the nature of the lesion for which laparotomy was performed and the extent of the operation necessary to deal with it, may considerably influence the risk of such a procedure. Complications due to the presence of pancreatic tissue are uncommon, and in many cases excision is unnecessary. However, each case must be treated on its merits, and some degree of stenosis of the intestine by circumferential spread of the pancreatic tissue, or projection into the bowel indicating the possibility of intussusception, may make excision advisable.

SUMMARY.

1. A case of pancreatic tissue in the wall of the small intestine, complicated by intestinal obstruction, and 4 additional cases discovered during routine post-mortem examination are reported.
2. Observations made on these cases support the hypothesis that the pancreatic tissue arises from the overlying intestinal epithelium.
3. The condition is more common than the number of cases reported in the literature would suggest.
4. Complications are uncommon, but it is important to recognise the nature of the tissue when it is found at operation, and the appearance is such that this is possible in the majority of cases.
5. The management of the condition is briefly discussed.

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DESMOID TUMOUR OF THE ABDOMINAL WALL.

By G. H. Burnell.
Adelaide.

THIS condition is reported for two reasons; firstly, desmoid tumours are not of common occurrence; secondly, while the use of filigrees in the repair of deficiencies in the abdominal wall is a very old procedure, the size of the tumour here reported was so great that a filigree of very large dimensions was necessary.

Miss E. B., aged 49, was first seen in October, 1949, when the following history was obtained. In April, 1947, she had undergone cholecystectomy. In April, 1948, she began to feel pain in the region of the incision, a right paramedian one. The pain was of a sharp stabbing nature, and was persistent; she could not get comfortable in any position. In September, 1948, she noticed a lump under the scar; she could both see and feel the lump, and says that it was then about three inches in diameter. It continued to grow, and in May, 1949, her doctor in the country removed a small piece of the tumour for biopsy. The report on this was:— "Section shows no evidence of carcinoma; the tumour is composed of proliferating fibroblasts; it is cellular, but mitoses are scanty. In one area there are a number of foreign body type giant cells. Appearances are consistent with a desmoid fibroma if the tumour was definitely invading muscle. The other possibility is reaction around a foreign body, but no particles are seen, and the fibroblast proliferation looks more neoplastic than inflammatory."

FIG. I. Appearance of the tumour at the time of operation.

On receipt of this report, her doctor, who did not consider total excision practicable, referred her to the radio-therapy clinic of the Royal Adelaide Hospital, with a view to deep therapy treatment.

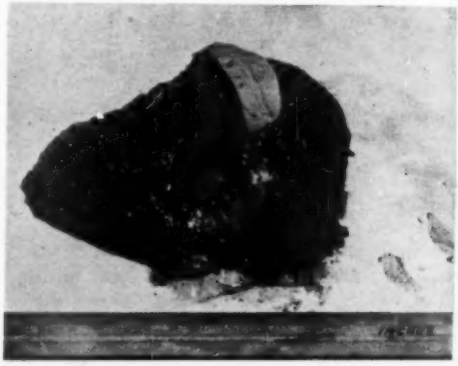

FIG. II. The tumour, after removal, showing the margin of apparently uninvolved muscle removed with it.

I saw her first in October, 1949. At that time the tumour was evident as a large round swelling, six inches in diameter, and standing at least one inch above the surrounding skin (Fig. I.). The centre of the swelling was near the outer border of the right rectus abdominis muscle in its upper portion: there was a scar passing over the centre of the swelling which was slightly tender; the skin over it was reddened, and warmer than the surrounding tissues; the tumour did not move on respiration, and was obviously within the abdominal wall; over the biopsy scar, the skin was adherent to the subjacent tumour. She was then suffering from considerable discomfort on movement, and was kept awake at night by this discomfort. Her previous history did not contain any significant feature, apart from the cholecystectomy.

When seen again on November 30th, the tumour had increased rapidly in size and now measured at least eight inches in diameter. It was very firm, slightly hot, and tender. As it was growing rapidly, it was decided to attempt its removal, but the treatment of the abdominal wall, subsequent to its removal, had given rise to considerable thought and anxiety. It was feared that the peritoneum would be adherent to the tumour, and would need to be removed with it. I had thought of replacing the peritoneum with a layer of amnion, taken, during Caesarian section, from a patient

with a similar blood group, as described by Kubanyi (1947); with this end in view, enquiries were made at the Queen Victoria Maternity Hospital in an attempt to arrange that such a Caesarian section might be done in a theatre adjoining the one in which I proposed to operate on my patient. However, this could not be arranged at an early date, so that, in view of the rapid growth of the tumour, it was felt that removal should be proceeded with. If the peritoneum had to be removed with the tumour the peritoneal deficiency would have to be made good by bringing across a layer of great omentum, and suturing it to the edges of the gap in the abdominal wall.. A very large filigree, made of stainless steel wire, 32 gauge, with reinforced edges, had been prepared for insertion under the edges of the gap in the abdominal wall. The filigree was fifteen inches long by eleven inches wide, and was roughly oval in shape.

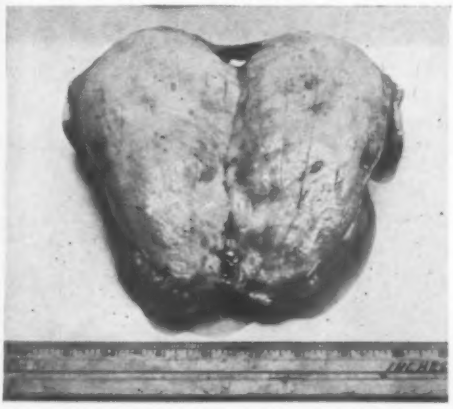

FIG. III. Cut surface of the tumour.

Operation.

On December 1st, 1949, under Pentothal, endotracheal cyclopropane and curare anaesthesia, a transverse incision was made at the level of a point midway between the umbilicus and the lower end of the sternum; it commenced in the right flank, and reached 3 inches to the left of the midline. At the ends of this transverse incision, two vertical incisions were made, so that upper and lower flaps could be dissected back. With the tumour thus exposed, an incision was made through the rectus sheath below the tumour, and it was then found that the peritoneum could be stripped off the deep surface. This was done over a wide area, and then the whole thickness of the abdominal wall, over the area occupied by the tumour, plus a one inch margin of muscle which appeared to be normal, was excised. The enormous gap in the abdominal wall, so created, was then protected by introducing the filigree; this was placed deep to the remaining portion of the abdominal wall, between the transversal is muscle and the peritoneum, and in such a way that the filigree overlapped the gap by about two inches all round. It was fixed in position with stainless steel sutures, and a further reinforcement by wire sutures running right across the wound from top to bottom, so that the filigree could not slip out of position. Finally the skin and subcutaneous tissue were approximated, and the wound was closed with a corrugated rubber drain through a stab incision in the right flank. Skiagrams (Figs. V and VI) show the filigree in position.

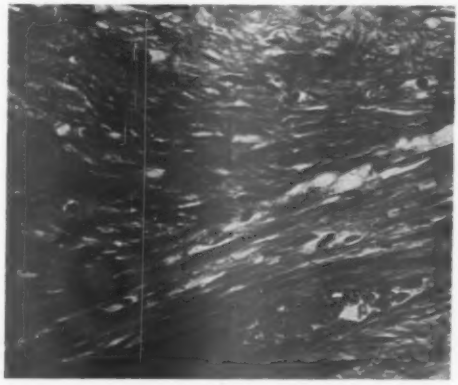

FIG. IV. High-power photomicrograph of a section of the tumour showing muscle bundles surrounded by the proliferating fibrous tissue. (x 320)

The appearance of the tumour is shown in Fig. II, and its cut surface in Fig. III.

FIG. V. Antero-posterior radiograph showing the large filigree in position.

Pathologist's Report.

A report on the tumour after removal was as follows:—

Macroscopic. A large solid off-white tumour of tough consistency, devoid of capsule, and merging into the attached muscle tissue.

FIG. VI. Lateral radiograph with the filigree in position.

Microscopic. Sections show a dense fibroma composed of conspicuous interlacing bundles of fibroblasts. The nuclei are of the usual elongated type but show rather more variation in size. Mitoses are scarce. Some areas show hyalinisation. The tumour is relatively avascular. At the margin muscle bundles are to be seen surrounded by the proliferating fibrous tissue. The appearances are characteristic of a "desmoid fibroma," (Fig. IV). Convalescence was uneventful, and the patient was discharged on December 20th, 1949.

It had been thought that, perhaps, the presence of such a large filigree, within the abdominal wall, would interfere with the patient's movements, but this was not the case, and she was able to touch her toes without any difficulty.

When seen recently, the abdominal wall was still quite firm, but at the inner angle of the incision, one of the edges had sloughed a little, exposing the end of one of the wire sutures used to retain the filigree in position. The small sloughed area was, however, granulating nicely, and I do not anticipate any difficulty in getting the wound to close.

SUMMARY.

A case of desmoid tumour of the abdominal wall is described, in which it was necessary to remove all muscular layers of the abdominal wall over an area eight inches by eight inches, reinforcing the gap so caused by the insertion of a large stainless steel wire filigree.

ACKNOWLEDGEMENT.

Dr. Leitch, the Surgeon Superintendent of the Royal Adelaide Hospital was good enough to prepare the filigree.

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GUMMA OF THE LUNG.

By M. P. Susman.

Sydney

IN an article written in 1949, Findlay, Lehman and Rottenberg point out that acquired syphilis of the lung is rare and they give references to papers that have been published in the last thirty years. Cancer, tuberculosis and chronic infections must be considered in the differential diagnosis, and as there is no characteristic symptomatology the diagnosis may only be made on the result of serological tests and response to treatment, or on the microscopical appearances of the lesion.

FIG. I. Irregular opacity at the base of the right lung.

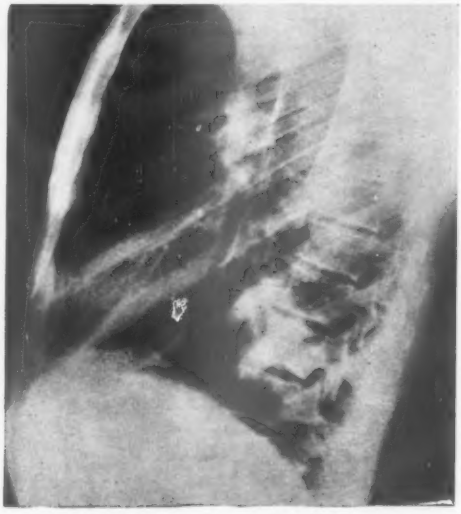

FIG. II. The opacity is better defined in the lateral view and is situated posteriorly.

Case Report.

A man aged 40 had been complaining for two years of abdominal discomfort, fatigue, cough with a little mucoid sputum and occasional pain in the chest. He was sallow but not anaemic and the only clinical abnormalities noted were mild fever, slight clubbing of the fingers and a loud friction rub at the right base. The sputum contained pus cells and some pyogenic organisms. Skiagrams showed an opacity in the lower and posterior part of the lung field. (Figs. I and II.) Bronchography and bronchoscopy gave no help. The Casoni and Mantoux tests were negative and the Wasserman and flocculation tests were strongly positive. Large doses of penicillin and sulphadiazine had no effect on the X-ray appearances but the patient's general condition improved. Because of the possibility of neoplasm exploratory thoracotomy was advised. The lung, free of adhesions, contained a hard mass with a smooth white surface in the lower lobe. The lower lobe only was removed, firstly because the diagnosis was still in doubt even after examination of a frozen section, and secondly because the mass was situated so peripherally that it was easy to get well above it by the usual hilar dissection of the lobe. The patient had an uneventful recovery and his general health has further improved with prolonged anti-syphilitic treatment, but the Wasserman reaction has remained positive. The cut surface of the lobe shows white, solid and irregular tissue in the lung parenchyma; there are several small areas of necrosis. (Fig. III.)

FIG. III. The lobe has been bisected; some of the lung parenchyma has been replaced by hard white tissue with areas of necrosis. (This photograph was taken at the Medical School through the courtesy of Professor K. Inglis.)

FIG. IV. Photomicrograph of margin of the lesion showing necrotic tissue surrounded by fibrosis. (x 150.)

Pathologist's Report. (Dr. B. Durie)

The tumour is almost certainly a gumma of the lung. The only other possibility is a chronic inflammatory lesion of unknown origin. All sections show extensive necrosis and the necrotic masses are surrounded by fibroplastic tissue. There is no evidence of tuberculosis and no acid-fast bacilli are seen in sections stained by Ziehl-Neilsen's method. A frozen section made at the time of operation was difficult to stain; the material was almost entirely necrotic, with a rim of tissue composed of round and spindle-shaped cells. At the time this suggested a diagnosis of neoplasm, but no evidence of neoplasm was found in the sections cut later from paraffin-embedded blocks.

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DELAYED SPLENIC HAEMORRHAGE.

A CLINICAL STUDY.

By J. T. Hueston.
Melbourne.

TRAUMATIC lesions of the abdominal viscera can be perplexing from the points of view both of diagnosis and prognosis. Next to the kidney, the spleen is the viscus most commonly injured by non-penetrating abdominal injuries. Although the entity of splenic haemorrhage remote from the initial injury is now well recognized, as far as can be ascertained from the literature no case was recorded before the beginning of this century. This condition was little studied prior to the classical paper by McIndoe (1932). From a review and correlation of the 46 cases then recorded, he established a sound basis for the clinical diagnosis and treatment of delayed splenic haemorrhage. Since then the most outstanding contribution has been the review of a larger series by Zabinski and Harkins (1943), who append a comprehensive bibliography.

The opportunity is rarely offered to follow closely the progress of the symptoms and signs in splenic haemorrhage from their onset. The case presented is of interest because of the unusually long latent period. The coincidence of a fractured femur which kept the patient in hospital enabled him to be kept under constant observation throughout this period. An attempt is made to correlate the clinical history with the state of the spleen on removal.

Case Report.

B.J., a sailor aged 21, while riding a motor-cycle swerved to avoid an on-coming car which struck him heavily on the left side, throwing him into a ditch.

On admission to hospital two hours later he was moderately shocked, and presented multiple left-sided injuries. He sustained a compound fracture of the mid-shaft of the left femur, fractured left radius and ulna, and a superficial abrasion on the left side of the abdomen. There was tenderness over the left lower ribs.

Open reduction and immediate plate fixation of the fractured femur was performed on the night of admission, and the leg was kept in suspended traction.

The day after the accident he complained of a sharp pain over the left side of the chest, worse on inspiration and on pressure over seventh and eight ribs in the axilla. Strapping fixation gave great relief. There were no abdominal symptoms, and convalescence proceeded with only a dull pain in the region of the lower left ribs which lasted about ten days, after which the strapping was removed. His temperature and pulse rate were elevated throughout this period. (See Fig. I.)

Sixteen days after admission the patient remarked on a cramping pain in the left hypochondrium, with some nausea but no vomiting. There was mild tenderness to the left of the mid-epigastrium but no rigidity. This was regarded as a mild digestive upset, and he was given an alkaline powder. Next morning he was free of pain and eating normally.

On the morning of the thirty-first day after admission the patient woke at 6.30 a.m. with vague abdominal discomfort and an urgent desire to vomit. The vomitus consisted of a small amount of pale bile-stained fluid. He was pale and sweating, with a blood pressure of 110/80 mm. of mercury and a pulse rate of 130 per minute. He was tender below the right costal margin, but no rigidity was present.

Frequent vomiting of small amounts continued for three hours. He was considerably distressed, but still only vaguely tender across the upper abdomen. This tenderness was now below both costal margins, still slightly worse on right side, but no rigidity was detectable. Although delayed splenic haemorrhage was considered at this stage, no splenic tumour was palpable.

At 10.30 a.m., four hours after the onset of this acute attack, he complained of severe pain across both shoulders distributed over the acromial and scapular regions, and worse on the left side. The abdominal pain was now almost wholly confined to the left hypochondrium, with local tenderness, and dullness on percussion. This dullness did not shift on movement of the patient and extended one hand-breadth below the costal margin. There was no tenderness rectally. The blood pressure remained at 110/80 mm. of mercury, and haemoglobin at 90 per cent. X-ray revealed no elevation of the left dome of the diaphragm, but showed crack fractures of the 7th and 8th ribs.

The diagnosis of splenic rupture was made, and transfusion instituted prior to operation which was commenced at 2.30 p.m., eight hours after the onset of symptoms.

Under Pentothal, curare and cyclopropane anaesthesia, the abdomen was opened through a transverse left sub-costal incision.

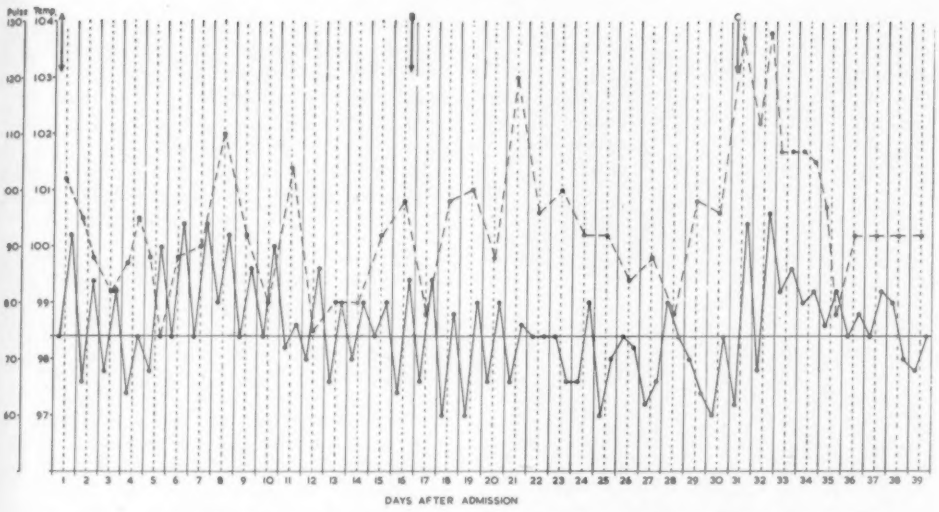

FIG. I. Chart illustrating the temperature and pulse rate during the latent period, and their relationship to the clinical events recorded. Temperature: continuous line; Pulse rate: broken line. Arrow A: initial injury; Arrow B: transient symptoms; Arrow C: splenectomy.

Operative Findings. When the peritoneum was opened there was a copious escape of dark fluid blood. Several clots and a moderate amount of blood were evacuated from the peritoneal cavity. Palpation revealed an enlarged turgid spleen which, when delivered into the wound, was found to be about four times normal size. The capsule was stretched, tense and glistening, with a large tear on the posterior surface adjacent to the hilum.

Splenectomy was performed. Some adhesions to the diaphragm posteriorly were torn during delivery of the spleen, and the bleeding controlled by oxycel gauze.

Specimen. The spleen was about four times normal size, and dark red in colour with scattered slightly elevated patches of deep purple from 0.5 to 3 cm. in diameter. The capsule was stretched and tense. There was a stellate tear on the medial part of the renal surface, extending to within 1 cm. of the splenic hilum, and filled with semi-clotted blood.

As can be seen in Fig. III, most of the splenic tissue was replaced by a series of haematomata. A large, soft fading haematoma (a) lies adjacent to a more recent, firm and darker region of blood clot (b). Immediately below the area of capsular

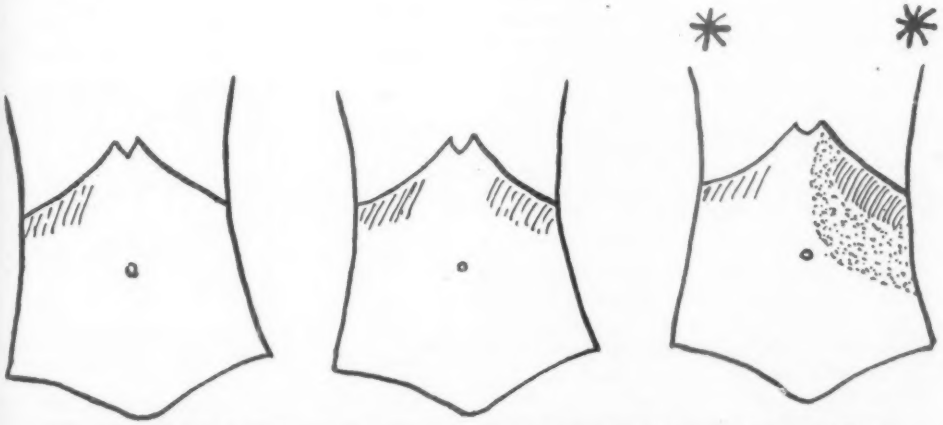

FIG. II. The march of symptoms: pain and tenderness are shown by shading, rigidity and dullness by dotted area, and the shoulder pain is indicated.

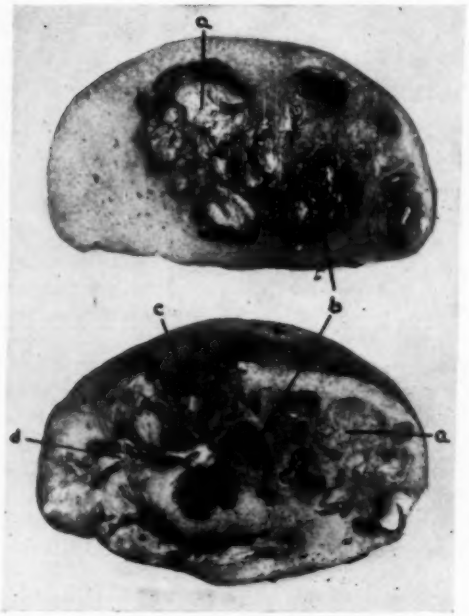

FIG. III. Sectioned operation specimen; showing a series of haematomata of varying age (a), (b) and (c), extending across the spleen. The site of capsular tear is (c), and (d) is the splenic hilum.

rupture (c) is the most recent site of haemorrhage which caused the capsular tearing. It would appear therefore, that bleeding had proceeded in three stages. At the right extremity of the specimen a deficiency is seen due to some clot being dislodged during handling of the specimen. This is not a site of rupture. The splenic tissue appeared normal.

COMMENT.

Initial Injury. The nature of the accident is classical, and supplies an obvious source of direct trauma to the splenic region. Throughout the literature by far the majority of initial injuries is sustained in falls or traffic accidents. The association of fractured ribs is found in 10-20 per cent. of recorded cases, and may add difficulties to the diagnosis by masking the local symptoms and signs of splenic haemorrhage.

Latent Period. The unusually long latent period is the feature most deserving of comment. The latent period as defined by McIndoe (1932) is "the interval between the cessation of splenic bleeding and the onset of secondary haemorrhage at a date remote from the primary injury." By this definition, cases are dismissed where bleeding has been continuing since the injury, but the signs are delayed and appear only when the local safeguard of capsule or haematoma gives way. The haemorrhage in these cases has been continuous but the rupture has been delayed. The time interval between injury and the clinical picture of rupture is much shorter in these cases and the term delayed "rupture" is more appropriate for them.

However, in those cases where a true latent period has existed, it is clear that the initial haemorrhage has ceased, and the later incident is more properly termed a delayed haemorrhage. The French term *haemorrhagie en deux temps*, is equally appropriate.

Considering the specimen obtained at operation and the clinical history, it is suggested that the initial motor cycle accident resulted in fractures of the left lower ribs and an intra-splenic haemorrhage. The haemorrhage was controlled by mounting intra-splenic tension, this being only possible because the splenic capsule was not lacerated. Sixteen days later, the transient symptoms in the left hypochondrium, with some elevation of temperature and pulse, were produced by a further haemorrhage. This also remained intra-splenic, but it is possibly of importance to note its proximity to the splenic pedicle (Fig. III). Subsequent softening in this region of major intra-splenic vessels was a likely cause of the final massive bleed which resulted in rupture of the splenic capsule. Perhaps one might be permitted then to regard this case as one of *haemorrhagie en trois temps.*

TABLE.

Latent Period	McIndoe (1932)	Zabinski and Harkins (1943)
2-6 days	23	22
7-11	12	15
12-16	4	7
17-21	3	1
22-26	1	1
27-30	1	2
31-41	–	3
3 months	–	1
6 months	1	–
2 years	–	1

The Table lists for comparison the two largest series reviewed in the literature. Of the 99 cases involved, only 6 occurred after

the thirtieth day. It is for this reason that the present case of haemorrhage on the thirty-first day is recorded. Zabinski and Harkins actually included 11 more cases than are shown, but since in these rupture occurred within forty-eight hours of injury, bleeding is regarded as having been continuous throughout and not the true delayed haemorrhage of McIndoe.

Mode of Onset. A feature of this case is that haemorrhage with rupture occurred during sleep. There was no straining at stool, or weight-lifting so often blamed for the rupture. The rupture is from within, and such strainings can only cause rupture by elevation of the blood pressure within the spleen.

Early nausea and vomiting is usually a feature of splenic haemorrhage because of its intimate anatomical relationship to the stomach.

The rapid progression of symptoms once rupture occurs is classical of this condition. After noting these last two features, one is forced to comment on the remark by Bell and Steele (1944) that their case illustrated the "typical sequence of events," when in fact their patient did not suffer nausea and vomiting at the onset, and was able to survive three days without surgery. Finally, although operation revealed free peritoneal haemorrhage, pain had been absent immediately prior to operation. Their case is therefore the more remarkable for being atypical.

The onset with pain in the right hypochondrium before extending to the left side has been noted also by Bailey (1930), but its origin is obscure.

Mortality. In cases of splenic haemorrhage which are not treated by operation, death is to be expected. This is due to the nature of the splenic tissue, and natural haemostasis is improbable after a delayed haemorrhage where the splenic tissue is softened and disrupted. For the same reason reliable haemostasis is unlikely to follow packing or suturing of splenic lacerations. Splenectomy is usually easier to perform, and is the most certain means of securing permanent arrest of splenic haemorrhage.

SUMMARY.

1. A case of unusually delayed splenic haemorrhage is reported, and the march of symptoms analysed in detail.

2. The clinical features have been correlated with the state of the specimen removed.

3. Splenic rupture due to delayed intrasplenic haemorrhage is distinguished from rupture due to continued initial haemorrhage.

ACKNOWLEDGEMENTS.

I wish to thank Mr. Bryan Keon-Cohen, and Mr. Howard Eddey for permission to report this case, and Mr. Roy Inglis for the photographs of the specimen.

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Books Reviewed.

STUDIES IN PATHOLOGY.

Edited by E. S. J. KING, T. E. LOWE and L. B. COX. Melbourne: Melbourne University Press, 1950. 5½" x 8½", x plus 350 pp., numerous illustrations. Price: 35s.

The consummation of a happily conceived project was effected on July 14th, 1950, when, at a memorable function in the Union Building of the University of Melbourne, and on the occasion of his sixty-fifth birthday, Professor Peter MacCallum was made the recipient of a *Festschrift* volume entitled "Studies in Pathology." Former and present day associates of Professor MacCallum in the School of Pathology of the University of Melbourne responded with alacrity to an invitation to contribute to a book, to be dedicated and presented to their Chief as an expression of their admiration of the services he has rendered to pathology and medicine during his twenty-five years' tenure of the Chair of Pathology in the University of Melbourne.

"Studies in Pathology," in that it achieves a nice balance between academic pathology and pathology of direct clinical application, is a well integrated collection of essays by 23 contributors.

E. S. J. King is the author of a thoughtful and well reasoned essay on the contribution of pathology to biology and sustains the thesis that the tissue modifications, not excepting tumour growth, which constitute so-called "abnormal" states, proceed according to biological rule.

G. L. Cameron, of University College Medical School, discusses normal and pathological patterns in the liver in an essentially readable and friendly manner, and incidentally emphasizes the need for revision of methods of investigation in pathology.

That the genesis of blood vessels is determined by the growth of other tissues is the text of a section by R. Douglas Wright, and R. A. Willis writes with his usual didactic clarity on metaplasia.

Ian C. Heinz surveys the association of lymphoid and epithelial tissues in the neck and mediastinum as it occurs in normal and pathological conditions, the latter embracing adeno-lymphoma, branchial cyst, malignant lympho-epithelial tumours, lymphadenoid goitre, and lateral aberrant thyroid tissue and tumours; he refers the conjunction of the two types of tissue to the close relationship between lymphoid and epithelial cells appreciable histologically and demonstrable in the embryo.

An authoritative article on myocardial infarction, a subject with which his name has long been associated, is that of T. E. Lowe, and a chapter on vascularization and haemorrhage in arterial walls, including those of coronary and cerebral vessels, by William B. Wartman, follows in natural sequence. Professor Wartman, of the Department of Pathology, Northwestern University Medical School, U.S.A., became a close associate and friend of Peter MacCallum during the period 1942-44, when the Fourth General Hospital, U.S.A. Army, to which Wartman was pathologist, was stationed in Melbourne.

H. F. Bettinger treats the difficult subject of genetic aspects of inter-sexuality clearly and logically, and a revealing and exhaustive study of systemic changes in rheumatoid arthritis is contributed by G. S. Christie.

Reginald Webster infuses a literary quality into his essay on phases of tuberculosis in childhood. W. McI. Rose, in considering infarcts, establishes the conclusions that infarction can occur even though the artery supplying a given area is not completely occluded, and that all infarcts—red, pale, or fluid—are essentially the same in origin and behaviour.

Much painstaking work and minute observations are embodied in the chapter on the location of glycogen in liver cells and lobules by J. W. Perry. Haemosiderosis is the subject of a paper by R. Motteram and W. E. King, from which it appears that, contrary to expectation, an excess of haemosiderin does not damage the cells in which it is deposited.

In an erudite discussion of lymphatic tissue, with special reference to the germinal centres, E. W. Bate reduces to order prevailing confusion regarding the nature and function of these distinctive histological features of the lymph node.

A general review of the much debated question of the essential nature of Hodgkin's disease, and details of seven examples in which focal necroses were prominent features in the morbid histology, are moulded by J. D. Hicks into a valuable contribution to the study of a subject in which much remains to be elucidated.

Commencing on a clinical note with the case record of a patient in whom chronic diabetes insipidus became acute as the result of infection of a cranio-pharyngeal remnant, L. B. Cox proceeds to an informed exposition of aetiological factors in diabetes insipidus, in which he assigns leading parts to tumours, and operative or other trauma affecting the pituitary and hypothalamic region.

J. J. Billings examines the therapeutics of pernicious anaemia and subacute combined degeneration of the cord, and A. W. Jackson recounts inquiries which led him to the conclusion that the role of maternal rubella in the causation of congenital cardiac defects sufficiently severe to result in death or require operation in the early years of life, has been overstated.

Of immediate interest to surgeons in active practice should be the contributions of E. E. Dunlop, J. G. Hayward, and C. G. Godfrey respectively. A detailed study of oesophageal malignancy in all its aspects is presented by Dunlop, and Hayward's consideration of carcinoma of the lung, its pathology, and the results attending surgical efforts at extirpation is notably realistic and divested of all wishful thinking. Godfrey, in a concise dissertation on "chocolate" cysts of the ovary, recognizes endometrial cysts, luteal and atretic follicular blood cysts, but urges that from the clinical point

of view they constitute a group to which the same principles of management and prognosis are applicable, all histological types of "chocolate" cysts appearing to possess the same potentialities.

Medical jurisprudence is represented in the volume by K. M. Bowden's clearly expressed article on the examination of blood and stains in crime detection.

Carefully edited by E. S. J. King, T. E. Lowe, and L. B. Cox, the book is very well produced, generously illustrated, and closely indexed. The list of subscribers included is eloquent testimony to the manner in which the proposal so to honour Peter MacCallum was endorsed by the medical profession at large, and the appeal inherent in its origin and purpose is reinforced by the intrinsic merit of a volume which is assured of an enduring place in the traditions of the Department of Pathology in the University of Melbourne. *Ave*, Peter MacCallum!

VARICOSE VEINS.

By R. ROWDEN FOOTE, M.R.C.S., L.R.C.P., D.Obst., R.C.O.G. London, Eng.: Butterworth & Co. (Publishers) Ltd., 1949. 6½" x 9½", xiv plus 226 pp., 205 illustrations, 3 coloured plates. Price: 44s.

The present book by Mr. Foote appears to be an elaboration of the less contentious parts of his previous book, "Varicose Veins Haemorrhoids and other Conditions: Their Treatment by Injection." (H. K. Lewis & Co. Ltd., London, 1944.)

The author states in his preface that, despite the fact that there are probably five million sufferers from varicose veins in Great Britain, no previous book wholly devoted to this subject has been written.

Whilst a completely satisfactory treatment for varicose veins has not yet been evolved, all sufferers can be benefited and the majority of complications prevented. Best results come from a co-operative teamwork in the attack against the varix.

The author gives the following indications for the use of sclerosant injection treatment alone:—

1. Varices unassociated with incompetence of veneous valves.
2. Primary intra-cutaneous varicose veins.
3. Recurrences after high resections of the veins.
4. The "feeder" vein of varicose ulcers.

While there is a 70 per cent. recurrence rate after the use of injection treatment alone, there may be a prolonged relief of symptoms. Even after recanalization of the veins has occurred, they may have a thickened intima and consequently may cause less symptoms than before injection.

Ethamolin (monoethanolamine oleate) is the most useful general-purpose sclerosing solution. Up to 6 c.c. can be given at a time in divided doses of between ½ and 2 c.c. As there may be reactions it is better to give ½ c.c. as a test dose at the first treatment. The author favours the empty vein injection technique, in which the patient is injected while lying down.

80 per cent. of the patients who present need operative treatment of some sort. As the patient is not suffering from a lethal disease, no avoidable risk is justified.

Surgery is confined to patients who have an incompetent superficial venous system. Early operative intervention lessens such complications as oedema, ulceration, eczema, and phlebitis. Prophylactic treatment of the veins before an abdominal operation or a pregnancy lessens the subsequent risk of thrombophlebitis and embolism.

It is of interest that Moore of Melbourne is credited with describing high ligation of the saphenous vein as a treatment of varicose veins in 1896, and was well ahead of his time in his attack on the varix, though his method did not seem to have received much notice at the time. His patients were ambulatory soon after operation.

The operation advised by Mr. Foote is ligation and resection of the saphenous vein flush with the femoral vein. Local anaesthesia allows of co-operation by the patient and immediate post-operative ambulation. A long "nutmeg-grater" needle with a pliant shaft is passed distally down the vein as far as possible. After traumatising the intima of the vein with the "nutmeg-grater" end, a sclerosant solution is injected through the needle shaft.

Of particular interest to nurses and dressers are the detailed instructions as to how to apply compression treatment by bandages. Some readers will disagree with compression treatments only extending as high as the knee. A list of the instruments used and the trays to be prepared for both injection and ligation operations should be of general help.

Nurses will be interested in the details involved in running a varicose vein clinic. Such details as of a trolley for use in the consulting room are clearly illustrated.

To conclude, this is an important book, though there is considerable "padding" which detracts from what is otherwise an excellent work.

A STORY OF NUTRITIONAL RESEARCH. The Effect of Some Dietary Factors on Bones and the Nervous System. (The Abraham Flexner Lectures, Series Number Nine).

By SIR EDWARD MELLANBY, G.B.E., M.D., Sc.D. F.R.S. Baltimore, U.S.A.: The Williams & Wilkins Company, 1950. 8" x 5", viii plus 454 pp., 73 figures, 40 tables, numerous plates. Price: 53s. 9d. (Sent by Angus & Robertson, Sydney.)

Sir Edward Mellanby has worked in the field of nutrition for the greater part of this century, and has taken a very active role in unravelling the complex nature of some of the vitamin-deficient diseases. In this book, which is based on the Abraham Flexner lectures delivered in 1947, he describes the work which has occupied his active life in the laboratory over a period of about thirty years. In the introduction he tells us that with the formation of the Medical Research Committee in 1913, (later to be known as the Medical Research Council), one of the original items listed for investigation was the aetiology of rickets, which at that time was unknown. Early experiments (1916-20) indicated firstly that rickets was due primarily to a deficiency in the diet of an antirachitic vitamin which was fat-soluble and thought to be the then so-called vitamin A, and secondly, that cereals aggravated the rachitic effect. By 1924 it was established that the original vitamin A was not one vitamin but two, and that the inco-ordination and

ataxia of rachitic animals were due to a deficiency, not of the antirachitic vitamin, but of the anti-xerophthalmic vitamin.

After this brief introduction to the subject, the first part of the book describes in some detail the degenerative changes in the nerves of vitamin A deficient animals; the attempts and failures to develop this problem until finally a more thorough investigation of the eighth nerve and the bony labyrinth, led to the discovery that the primary disorder was in the bones, and that the nerve changes were secondary. There follows a comprehensive description of the overgrowth and malformation of bones in vitamin A deficient animals.

The second part of the book deals with the interfering effect of cereals on bone calcification. The experiments described here were carried out to clarify the earlier finding that some cereals increased the degree of rickets in animals on a rachitic diet. Ultimately, this effect of cereals was traced to the phytate content of the cereal.

This book is an authoritative and detailed account of the subject, supplemented by two appendices of the methods employed, and by a full bibliography. Maybe there is too much detail, which does not make it an easy story to read. Nevertheless, those interested in the remarkable development of the science of nutrition during the present century should read it not only for the facts it contains about vitamins and bone formation, but because it clearly shows the value of carefully prepared and controlled experiments, the difficulties which so often perplex the research worker and the perseverance and determination which are necessary for success.

PRINCIPLES AND PRACTICE OF PLASTIC SURGERY...
By ARTHUR JOSEPH BARSKY, M.D., D.D.S. Baltimore, U.S.A.: The Williams & Wilkins Company, 1950. 10" x 6½", 499 pp., 1029 illustrations, 6 in colour. Price: £5 7s. 6d.
(Sent by Angus & Robertson Ltd., Sydney.)

Although this appears to be a new book, it is in reality an enlarged modification of a previous book, "Plastic Surgery" by the same author and published by Saunders in 1938. Though this is not mentioned or referred to in the volume under review, much of the text and illustrations are exactly as appeared in the author's previous publication in relation to which this new volume can only in effect be regarded as an enlarged edition.

This work is probably the nearest approach to a primer of plastic surgery and should be of good use to all surgeons who wish to acquaint themselves with the principles of this work or refer in an elementary way to special problems which might confront them. Such a book serves a real purpose and one can only review this volume in regard to the relative emphasis it gives to various aspects of the work, adjustments of which would still further improve its value.

Four pages of exact and flat geometrical design in methods of skin closure are of no true value and prone to give either wrong impression or unnatural suggestion. The elements of design in this work are essentially of a three plane nature and can only be considered in relation to many variants such as skin tension, elasticity, attachments and blood supply. The eponymous nomenclature associated with these diagrams is awkward and outmoded. If the author can expend such detail on "frostbite" and technicalities of radio-therapy as would generally and rightly be regarded in the province of the expert in this speciality it is a great pity that considerably more emphasis, both in text and illustration, is not placed on the application of plastic principles and procedure in the primary treatment of injury, which today constitutes one of its strongest indications. So often the all important indication for primary repair is not met by the high order of surgical technicalities which are called for. So, too, the chapter on face fractures is poor and unreal in the light of modern high speed transport accidents. The few words that are given on fractures of the maxilla are deficient and cannot be excused if the author can spend some pages relative to his own technique of repair of soft tissues for a middle third face defect which include no new principles and for which the indication is a rare one.

The chapter on cleft lip and palate is well set out and only the best of modern methods are detailed but the treatment of syndactaly, as illustrated, one feels would not give results up to the best modern standards.

The volume is well arranged and well illustrated but the re-duplicated colour plates in the frontispiece are not good. They look unreal and serve no special value in a book, the cost of which, in this country, is very high.

Books Received.

MALADIES ET SYNDROMES RARES OU PEU CONNUS DESCRIPTION CLINIQUE—RÉPERTOIRE DES SIGNES ET LISTE DES NOMS PROPRES.
By A. AIMES. Preface by PROF. E. JEANBRAU. Second Edition. Paris: Masson et Cie, 1950. 6¾" x 9", 336 pp., 31 figures. Price: 920 fr.

MODERN PRACTICE IN DERMATOLOGY.
Edited by G. B. MITCHELL-HEGGS, O.B.E., M.D., F.R.C.P. London: Butterworth & Co. (Publishers) Ltd., 1950. 6½" x 9½", xxv plus 836 pp., 319 illustrations. Price: 82s.

LES INFILTRATIONS DU SYMPATHIQUE PHYSIOLOGIE. INDICATIONS. TECHNIQUES.
By MAURICE LUZUY. Preface by PROF. R. LERICHE. Second Edition. Paris: Masson et Cie, 1950. 6½" x 10", 302 pp., 77 figures. Price: 1200fr.

PHYSICIANS HANDBOOK.
By MARCUS A. KRUPP, M.D., NORMAN J. SWEET, M.D., ERNEST JAWETZ, Ph.D., M.D., CHARLES D. ARMSTRONG, M.D. Sixth Edition. California, U.S.A.: University Medical Publishers, 1950. 7" x 4", iv plus 380 pp., numerous illustrations and tables. Price: $2.50.

THE RESULTS OF RADIUM AND X-RAY THERAPY IN MALIGNANT DISEASE. Third statistical report.
By RALSTON PATERSON, MARGARET TOD and MARION RUSSELL. Edinburgh: E. & S. Livingstone Ltd., 1950. 6" x 9½", 167 pp., no illustrations, 43 tables. Price: 10s. 6d. net.

SOVIET PSYCHIATRY.
By JOSEPH WORTIS, M.D. Baltimore, U.S.A.: The Williams & Wilkins Company, 1950. 5½" x 9", xv plus 314 pp., no illustrations. Price: 53s. 9d.
(Sent for review by Angus & Robertson Ltd., Sydney.)